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Subscriptions—In the United States, its possessions, and Mexico, $5.00 yearly; Canada, $5.50; elsewhere, $6.50 the year.

Advertising rates on application. All advertising must conform to American Medical Association Rules.

Published monthly at Chicago, Illinois, by American Congress of Physical Therapy.

Entered as Second Class Matter June 2, 1930, at the Post Office at Chicago, Illinois, under the Act of March 3, 1879.

DISRAELI KOBAK, M.D., Editor

Suite 716 — 30 North Michigan Avenue, Chicago, Illinois

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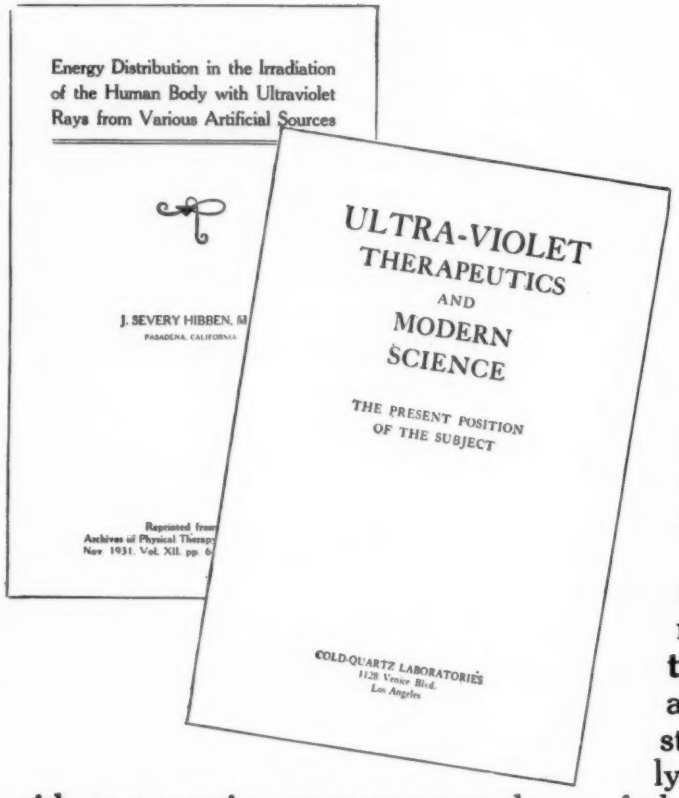
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THE POST-PARALYTIC TREATMENT OF POLIOMYELITIS FROM THE ORTHOPEDIC STANDPOINT *

WALTER I. GALLAND, M.D.

NEW YORK CITY

It is a difficult task to attempt to elucidate before a body of physicians any hopefully useful outline for their guidance in treating the patient crippled by the scourge of poliomyelitis. After listening to a symposium upon this subject we are all apt to echo the thought of the poet-philosopher Omar Khayyam who said:

> "Myself when young did eagerly frequent
> Doctor and Saint, and heard great argument
> About it and about; but evermore
> Came out by the same door wherein I went."

Perhaps tonight you too will feel that you are departing by the "same door wherein you entered," for the final page in the treatment of this disease has yet to be written. The best that can be offered, in the present stage of our knowledge are some thoughts which may be of help in eliminating those factors which may lead to avoidable and severe crippledom.

We cannot entirely dissociate the convalescent care of the paralytic patient from that of the patient in the acute stage of the disease, for the dividing line between these phases is not well defined, and certain of the symptoms of the acute stage are apt to extend rather indefinitely into the convalescent period and complicate the handling of the case from a purely orthopedic standpoint. It is a common experience in the handling of this disease to meet with a type of case which may well be termed "hyperaesthetic poliomyelitis." This symptom complex varies in the different epidemics and at times dominates the picture. The patient exhibits sensitiveness to even the gentlest manipulation of the involved parts and frequently even the most guarded movements elicit excruciating pain. Not rarely there is associated spasm of the uninvolved muscles which is apt to cause the early development of marked deformity. I have seen cases with hyperaesthesia referred to a hip joint with associated spasm of the flexors and adductors so intense that intra-articular pathology was suspected. Hyperaesthesia of the leg and ankle will frequently produce in these subjects a rapidly developing and rigidly resistant equinus which cannot be controlled in plaster or in splints without tremendously increasing the pain. Massage and any form of artificial muscle stimulation serve only to prolong the period of hyperaesthesia.

Supports for Prevention of Deformities

It is important then to consider the means by which this troublesome syndrome can be most readily ameliorated so that deformities can be painlessly prevented or overcome and rational therapy instituted. In a large proportion of these cases absolute rest and freedom from irritation, which means of course total abstinence from any attempts at manipulative procedures, will effect a satisfactory subsidence of these troublesome sensory symptoms. For the patient who exhibits a prolonged persistence of hyperaesthesia, the skillful use of x-ray therapy applied to the involved spinal segments will frequently cause a rapid disappearance of pain. Such treatments are given at weekly intervals, employing a 20 per cent skin erythema dose. Exposures should be made alternately on the anterior and posterior surfaces of the body at the level of the involved spinal segments. Reasonably consistent results from this treatment can be expected.

The disposition towards the rapid development of deformity in poliomyelitis and the necessity of preventing the development of deformity is too well recognized by the physician to require elaboration on my part.

The factors which are responsible for the deformities characteristic of this disease, are, disturbance of normal muscle balance, gravitational influences, posture, static strains, and trophic tissue changes. These are the factors which must be considered in our campaign against deformation.

In the early days of the illness, even during the active stage, the affected parts must be supported. At this period sand-bags and properly placed pillows are usually adequate to maintain the desired position of the paralyzed members. Foot drop, flexion contractures of

* Read at the Seminar conducted under the auspices of the New York Physical Therapy Society, October 7, 1931.

the knees and hips and even lateral deviations of the spine have their beginnings early in the disease. Apart from the crude method of sand bag support, which latter must be used only as a temporary expedient, we have at our command two methods of effectively controlling deformity. We can resort to the use of plaster of Paris or to the use of braces and other mechanical devices. Which of these methods we use will depend upon the exigencies of the situation and on the availability of a good brace maker who is susceptible to medical guidance.

Plaster of Paris as a means of preventing deformity is peculiarly suited to the early stages of convalescence. It must be applied in such a manner as to support the paralyzed parts insofar as possible in a position favoring the return of muscle tonus and proper articular function. The total inclusion of any considerable portion of the body in irremovable plaster casts over a long period of time, as is frequently done, is to my mind illogical and unphysiological. The plaster should be bivalved after it has set so that the parts can be removed for inspection, treatment or exercise of the included members and subsequently replaced. The use of the plaster of Paris shell is to be heartily recommended, particularly when the back is involved. This shell is moulded directly upon the patient in the following manner. The patient is placed in the ventral decubitus upon a firm table. The spine is slightly hyperextended and the spinous process brought into alignment. A layer of light felt is placed over the back, and over such other parts as may be included in the shell, and over this felt, held smoothly and firmly to the parts by assistants, plaster of Paris bandages are placed, layer by layer, until sufficient thickness of plaster has been secured. The finished shell fits the body accurately and in this shell the patient lies held securely but comfortably in the corrected position, while at the same time there is no confinement of the costal cage or abdomen, and respiratory and abdominal movements are free from interfering confinement. In this device, too, the patient is always easily available for the purposes of any treatment whatsoever.

In applying plaster of Paris dressings to the paralyzed parts, we must always consider the nature of the muscle involvement. In cases in which one group of muscles is involved without any weakening of the antagonist group, we must make an effort to somewhat overcorrect the impending deformity, so that the origins and insertions of the affected muscles are brought together as close as is reasonably possible. A weakened muscle overstretched by the constant tonic pull of an active antagonist will never regain power; a fatigued muscle too, will never regain power if it is always under constant stress. A weakened muscle must be relieved from all gravitational and postural stresses which produce fatigue, and must be placed at rest in that position which permits the involved muscle to retract to its normal tonic length.

Position of Extremities

There are so many varied types of involvement in infantile paralysis that no arbitrary rule can be established to guide us in determining the position in which a part should be held during the convalescent stage. In general we may say, that the feet should be kept at right angles to the leg, in moderate inversion, or if the tibial muscles are involved, in marked inversion. On the other hand, if the tibial muscles are active and the personal muscles are paralyzed, the foot must be placed in marked eversion in order to relieve the paralyzed muscles from strain. In the presence of a paralysis of the gastrocnemius group, the foot must be placed in a position of extreme equinus unless the dorsiflexor group is also involved, in which case a neutral position at right angles is essential. The knees must always be kept in complete extension except perhaps in that unusual case in which the quadriceps extensor muscle is uninvolved, and the hamstring muscles are paralyzed, in which situation a semi-flexed position of the knee, carefully supervised to avoid any possible supervening capsular contracture, may be permissible. It is essential for all of us to realize the importance of the knee joint in cases of infantile paralysis. The existence of even a mild flexion contracture of this joint in the presence of the slightest weakness of the quadriceps muscles will lead to a very grave and avoidable disability. The slightly flexed joint is prone to collapse very much as would a partly closed blade of a pen-knife, if longitudinal pressure were exerted upon the handle of the knife with the point resting upon a firm surface. When the blade of this knife is fully open and in alignment with the handle, full pressure can be made upon the handle in the

same situation without causing the blade to close. The knee joint behaves in exactly this manner, and for this reason, we must see that we always have a completely extendable knee, for with such an extendable joint even in the presence of complete paralysis of the quadriceps a patient may be able to walk without the use of any apparatus whatsoever.

In a similar manner flexion deformity of the hips is to be guarded against, as this deformity is well-nigh as incapacitating as the flexion deformity of the knee. The hips should always be fully extended and should be kept in neutral rotation so that the patella faces forward.

In the upper extremities the most usual incapacitating involvement is that of the abductors of the shoulder. By virtue of this paralysis the arms hang closely adducted to the body, and there is very early development of subluxation and diastasis of the shoulder joint. It is important to establish an abducted position of the shoulder in the presence of this paralysis either by means of plaster or by means of an abduction brace. The arm should be held in the majority of cases at right angles to the body in ten to fifteen degrees of forward flexion with the elbow at right angles and the wrist in dorsiflexion.

In paralysis of muscles of the back, the spine must be held in absolute alignment and in a slightly hyperextended position. The convex gas-pipe-frame is most useful in providing protection for the paralyzed back.

Rehabilitation of Muscle Function Through Physical Therapy

The period of immobilization cannot be arbitrarily fixed. With the complete disappearance of hyperaesthesia and muscle tenderness, and after it is evident that all acute manifestations have totally subsided, we must begin to attempt to rehabilitate muscle function. Our object will, of course, be to gradually encourage the use of the involved parts by means of carefully graduated exercises. It will always be necessary to avoid overtaxing the involved muscles, and for this reason we must at all times, particularly in the early phase of returning muscle power, attempt to reduce resistance to an absolute minimum in regard to any given motion. For this reason exercises given with the body immersed in warm water have come into widespread use. Inasmuch as the body is of approximately the same specific gravity as water the extremities are virtually floating, and are therefore unweighted, and motions can be consummated against a minimum of resistance. The water bath, however, is not essential, as it is usually possible to place the extremities in positions which remove the resistance offered by gravity, and thus we can secure minimal resistance to motion.

Exercise periods must not be unduly prolonged and fatigue must be assiduously avoided. Physical therapy is of value in supplementing voluntary exercise, but the undesirability of overtreatment must be kept in mind. A few contractions of a muscle by means of electric stimulation may be useful in maintaining muscle tone providing such contractions are consummated without pain and are not persisted in to the point of fatigue. It is obvious, too, that a muscle belly thoroughly warmed to a point slightly above body temperature will be more responsive to voluntary and artificial stimulus than the same muscle would be in an extremity rendered cold by the trophic vascular changes so commonly seen in this affection. Massage relegated to over-enthusiastic proponents of that art is apt to be injurious. Purposeful and gentle massage designed to combat tendencies towards contractures is of considerable value.

Artificial Supports

There can be no doubt that great injury is commonly inflicted upon the convalescent paralytic case by re-establishing weight-bearing function too early. The period of recumbency is usually not sufficiently prolonged. When it is determined that weight-bearing function can be re-established, it is essential to consider the desirability of supporting and protecting the weakened parts by means of adequate braces. A brace must be an efficiently designed mechanical device constructed in such a manner as to relieve the affected parts from certain undesirable stresses and deforming influences. The brace maker must not be the designer of the brace, but only the constructing mechanic. The physician must be the architect, and each brace must be an individual piece of machine design. Braces cannot be constructed on the basis of quantity output. There are several common defects in brace work, which should be avoided. If the apparatus or any part thereof causes undue pressure upon the body of a muscle, there

will eventually ensue lasting damage to that muscle. It is a frequent experience to see braces with narrow metal calf bands which have by prolonged pressure caused deep grooves to be inflicted upon the calf muscles. These grooves mean that scar tissue replacement has occurred in the body of the muscles due to the persisting long standing trauma of the calf band. Likewise the pressure of metallic bands against bony prominences causes the development of painful inflamed bursae which add to the disability of the patient. The brace must always be constructed with a view to avoiding such difficulties. Encircling bands must be broad, and pressure must be evenly distributed. Padding must be adequate, and above all the brace must be purposeful.

A brace cannot be expected to correct deformities, unless they are of a very mild type, and therefore in so far as possible, we must attempt to overcome deformity before the application of a brace. A brace thus applied is able to preserve the normal contour of the extremity. For example, we do not attempt to prevent a flexed knee from collapsing under weight-bearing by means of a brace, for the necessary pressure exerted by the brace on every step will injure the extremity. We first correct the underlying flexion contracture of the knee, and then apply a brace merely for its stabilizing influence.

The use of the Thomas ring principle is most valuable in providing ambulatory support for a grossly weakened lower extremity. The patient thus provided bears the body weight upon the ischium and virtually sits upon his brace and the extremity functions in a practically unweighted state.

The support of a severely paralyzed back by means of a brace is a difficult, and perhaps an impossible problem in brace construction, and extreme caution is to be urged in re-establishing the erect posture in these cases, or else the most intractable deformities of poliomyelitis may ensue. When it is considered desirable to attempt to re-establish the erect posture in a case of a patient who has exhibited paralysis of the back muscles, great care is necessary in supervising the design of the spinal brace. Owing to the anatomical configuration and situation of the spine, we can approach the problem of supporting this flexible column only in a very indirect manner. It is obvious that the spinal column cannot be enclosed in a supporting mechanism as can an extremity which is immediately accessible. We can attempt in so far as possible to unweight the spine by throwing some of the carrying burden at least, upon the mechanical members of the brace. We can also attempt to indirectly exert forces resisting lateral deformations by counter-forces transmitted through the medium of the costal cage, and we can increase to some extent the rigidity of the spinal column by enforcing a hyperextended position thereupon, which, by causing firm interlocking of the intra-articular facets, establishes a certain degree of rigidity upon the spinal axis. The well-designed spinal brace for these purposes must have firm bearing upon the pelvis, and must by means of generously padded axillary crutches receive some of the weight of the shoulder girdle and maintain a symmetrical position thereof. At the best, the most carefully designed spinal brace is inefficient, and the back thus supported must be under constant supervision.

Weight Bearing Index of Vertebral Column

Attention must be paid to an early and extremely sensitive index of the behavior of the vertebral column under weight bearing. Particularly in somewhat stout individuals it is difficult from superficial inspection to determine the intimate alignment of the spinous processes, and before the deviation becomes grossly manifest from casual inspection, lateral curvature and rotatory deformation have already begun. If, however, attention is paid not only to the position of the spinous processes, but also to the triangular spaces enclosed by the ilio-lumbar folds and the arms hanging in complete relaxation — the patient standing in erect posture — it will be noted very early, that the slightest deviation of the spine will cause an asymmetry of the triangular space on the one as compared to that on the other side of the body.

A second sensitive index, and one which is most important, is that of the so-called decompensation of the shoulders. By this we mean that the shoulders are not carried in vertical alignment with the pelvis. Plumb lines dropped from the acromio-clavicular articulations in such a decompensated spine will not traverse symmetrical points on the pelvis. Any increasing tendency towards decompensation must be regarded as a danger sign, and recumbency must be re-established. Persistently increasing decompensation calls

for radical measures. The value of a plaster shell moulded with the shoulders decompensated towards the opposite side is great in the early stages of the development of such deformity. Intractable cases will, of course, eventually require stabilizing operations.

The advantages of the airplane type of brace in paralyses of the abductors of the shoulders should always be kept in mind. This brace should be so designed as to avoid undue pressure upon the ribs of the paralyzed side, as the constant pressure of the supported arm thus transmitted to the spine can predispose towards spinal deviations. On the paralyzed side the frame of such a brace should be carried down sufficiently to find a seating upon the pelvic crest. The elbow should usually be held at right angles, and the forearm should be in supination, inasmuch as this is the most useful position for the hand.

During the continuance of brace support, we must, of course, persist in all other measures which will encourage the return of muscle power through maintaining the tone and nutrition of the involved muscles. Physical therapeutic measures and supervised exercise periods must be persisted in. At all times the development of deformity must be watched for, and corrected in the earliest recognizable stage. The degree to which we can maintain normal relationship of parts will determine to a large extent the severity of the necessary operative procedures which may eventually be required.

Surgical Intervention

It is generally conceded by those cognizant of the natural history of poliomyelitis, that the maximum period during which improvement of muscle power can be expected is from eighteen months to two years after the onset of the paralysis. Further improvement then can be expected largely from recourse to operative procedures. During this interval of expected progress the patient, usually a child, is of necessity subject to a régime naturally arduous and distasteful to the instincts of childhood. Medicine must be practiced as an art as well as a profession, and the art in this after-care is manifest by the physician who can succeed in securing the co-operation of his patient, by making the necessary régime assume at least some of the characteristics of play. The apparatus which is so uncomfortable that it becomes burdensome, and the exercise periods which engender resentment in the childish mind are ill-spent efforts. For this reason those institutions which have established the pool as a medium of re-educational exercise have had notable success. Swimming is an accomplishment which can be attained by even severely paralyzed subjects, and properly guided immersion exercises can be transformed into enjoyable play periods. Even without the convenience of a pool, it is possible to devise play exercises in the form of games and occupational therapy which can interest the mind and appeal to the play instincts without sacrificing the utility from the physiological point of view. This is a task which may tax our ingenuity and test our ability to practice the art of medicine.

After we have carried the patient through the period above mentioned, and it is evident that further natural improvement can no longer be expected, we must consider the advisability of operative intervention to secure further results. This does not mean that minor manipulative measures must not be resorted to before the termination of two years, for as has already been pointed out, contractures and developing deformity must be redressed as soon as they become evident. To even attempt to outline the multitude of operations which are at times indicated for the relief of the terminal disability of poliomyelitis would be a colossal task. In general we avail ourselves of three major types of procedures: first: the purely manipulative operation in which by carefully gauged but somewhat forcible manœuvres, contractures are corrected usually in the line of an articulation; secondly, operations which attack the soft tissues by open methods. Tenotomies, tendon lengthings, fasciotomies, capsulotomies and tendon transplantations are among the most important under this heading. And lastly, operations designed to secure stability of parts rendered more or less flail, by means of securing bony fusion between the articulations of the involved parts, and thus substituting firm bony ankylosis in the place of unstabile excessively mobile parts. This latter method has gained great favor in recent years.

The surgery of infantile paralysis has been a record of repeated trial and error. For a time great possibilities were looked for in the field of muscle transplantation, but unfortunately the results over a period of years have been disappointing. Combined, however, with

the method of bone stabilization, transplantation is again coming into considerable favor in certain selected cases. Bone stabilizations on the other hand, while yielding excellent stability, frequently result in disappointing functional results by virtue of the inflexibility of the resultant elimination of normal articular motion. The question of operation must be approached with considerable circumspection. For the most part, we can aim only at a certain degree of improvement, and the physician and patient must appreciate, that there comes a time in every case when we must admit that the percentage gain in function from a possible operation does not compensate for the anaesthetic risk and for the operative morbidity, mortality and psychic injury. In our clinics are patients who drift from hospital to hospital chasing the phantom of hope for cure, and who submit to repeated operations; in fact, insist upon these operations in which the maximum functional gain expressed in terms of percentage of normal is pitifully small. We can by operation place many patients upon their feet, who otherwise would have spent their lives in wheel-chair invalidism. We can relieve others of the necessity of wearing braces, but in the vast majority of cases, we cannot produce conditions approximating cure, and therefore this word should be deleted from our vocabulary in regard to these cases. We should impress the patient with the distinction between improvement and cure, and we should ourselves have some conception for the benefit of the patient, when the limit of improvement has been attained.

Conclusion

The whole picture is unsatisfactory, but not discouraging. We cannot even in this age of science rebuild a dead anterior horn cell. We can, however, ameliorate the conditions which the death of that cell has imposed upon the animal economy. We can minimize the effects of the death of that cell to such an extent, that otherwise hopelessly impaired individuals can be returned by us to society as productive units in human affairs. This, however, can only be accomplished by the intelligent co-operation of the various methods outlined above. The management of poliomyelitis today involves no single method that is altogether inclusive. It requires the best coordination of the experienced internist, the surgeon and the Physical Therapist.

(*Discussion of Galland's paper and the two following papers of this symposium on Poliomyelitis is continued on page 141.*)

ROENTGEN THERAPY IN INFANTILE PARALYSIS *

A Review of Technique and Results of Treatment

LEON T. LE WALD, M.D.
Professor of Roentgenology, New York University
NEW YORK CITY

Bordier, of Lyon, first used x-rays in the treatment of a case of progressive muscular atrophy due to chronic anterior poliomyelitis in 1911. In January, 1921, Bordier published the details of his technique in the *Review Medicine Francaise*. Since that time a number of men have used what is now known as the Bordier method, or modification of it—nearly all of them being continental investigators. There are now in the Index Medicus forty to fifty articles dealing with the radiological aspect of the method. There are radiologists like Delherm, of Paris, who presented a paper on this subject at the recent International Congress who admit that there is nothing illogical about the use of Roentgen rays and actually include it in their treatment of infantile paralysis, but are not convinced that these rays are of any particular value.

Various investigators have shown that x-rays have very definite biological effects in inflammatory processes and that they are extensively used in a variety of such conditions. These inflammatory processes are characterized by:

1. Edema of the tissues involved; exudates and transudates are produced which by pressure effects on the cells and blood vessels

* Read at the Seminar conducted under the auspices of the New York Physical Therapy Society, October 7, 1931.

interfere with the health and function of these cells.

2. Inflammatory products — toxins, etc., further impair the vitality of cells and tissues and degeneration and death of these structures frequently ensue.

3. In the case of infantile paralysis the virus itself may destroy or seriously injure the cells of the anterior horns.

4. Finally the production of cicatricial tissue. Inflammatory disease interferes with the return of vitality and function in such regions.

It is claimed and generally accepted that x-rays may exert a beneficial influence on various inflammatory changes. In brief, the effects are:

1. The inflammatory process is inhibited.

2. Edema is diminished and inflammatory products absorbed.

3. Fibrous connective tissue cells are destroyed especially if young sclero—or fibrolytic effect.

4. The virus is injured—not directly, but probably through the production of anti-virus substances.

5. A stimulating effect on the tissue cells, especially the motor cells of the anterior horns.

Technique

1. Bordier has employed the following method: Three series of consecutive radiations. For each series the average dose measured at the skin, with a filter of 6 mm. Al. is 800 r. units. For quite small children a dose of 500 to 600 r. units is sufficient. The longer standing the poliomyelitis the stronger should be the dose.

The region between the 11th dorsal and 1st lumbar vertebrae is exposed in paralysis of the lower limbs; and in paralysis of the upper limbs, 3rd to 6th cervical.

The rays are directed obliquely on the spine so as to get as great a depth dose as possible into the anterior horns.

Bordier insists on the importance of early application of Roentgen rays.

2. Chizzola Technique: The spinal segment corresponding to the paralyzed area should be lightly irradiated using 0.5 mm. copper and 1 mm. Al. Rays should be perpendicular to the vertebral laminae, angle of 25 degrees for the cervical vertebrae and 30 degrees for the dorso-lumbar. He uses a paravertebral zone 6-7 cm. on each side of the spine. He gives a quarter of an erythema dose on each zone on each of 3 or 4 consecutive days. Doses are measured with a Solomon ionometer. An interval of 3 weeks should be observed between each series; 2-3 series according to case. Between each series he uses diathermy daily. Chizzola insists on the importance of early Roentgen treatment—as early as possible. He also insists on Bordier's technique being strictly followed. He believes that the principal factor in his treatment is radiotherapy at the start followed by diathermy and electrotherapy.

Dr. Leon Linier—specialist in Pediatrics—Troca Hospital, Paris, is an enthusiastic advocate of Bordier's method. He states, "I have no hesitation in saying that children treated by the Bordier method have the best chance of recovery with the fewest sequelae."

Turano has treated a large number of cases in a similar fashion. He says, "Once the action of degeneration has appeared in a group of muscles they have never been known to recover spontaneously their active movements, reflexes, etc., nor has the reaction of degeneration ever been known to disappear completely." He has confirmed Bordier's results and believes that there is no better method of treatment.

Prof. Berghing (pediatrician) of Padua, says: "Complete recoveries including the return of reflexes and permanent disappearance of atrophy and the usual trophic and circulatory lesions have been brought about by the treatment, or at least permanently and comparatively rapidly improved as compared with similar cases not treated by the Bordier method." Dr. R. Portret is convinced that "A thorough comparative study of the old galvanism treatment and the new method of Bordier clearly proves the superiority of the latter." According to Drs. Manuel and Francis Arce, "The most striking results were obtained with patients who were treated immediately the disease had made its appearance . . . . But though the Bordier method fails in some cases there are others with complete R.D. recovering after a full course of treatment if given early." Bergamini states: "Considerable improvement even when the R.D. has been complete."

9. Delherm and Laquerriere believe that the optimists are over enthusiastic over cases that have had an early spontaneous recovery

during the early period when radiotherapy is reputed to give the best results. They believe that electrodiagnosis will help to judge whether a recovery was spontaneous or due to therapy. In 280 cases investigated by them this diagnostic aid was used in only a few cases in a satisfactory manner. In this study they find that 15 cases of complete R.D. are claimed and have shown improvement. They state that they have not been able to prevent the development of complete R.D. with radiotherapy. They think, however, that it is not advisable to withhold Radiotherapy from sufferers, and it is their practice to give it as early as possible but give no details of technique.

10. Duhem is also conservative in his estimation regarding Radiotherapy. "I have never," he says, "thoroughly convinced myself of the value of Radiotherapy. In all cases where it was applied early it is impossible to distinguish the cases which reacted to Radiotherapy and those in which improvement was due to spontaneous regression of the disease. I have never employed it by itself. I have often omitted to employ it and my general results were not sensibly modified. I shall continue to employ it because as I have shown in my report it is not harmful and its action is not illogical."

Conclusion

Opinions regarding the specific value of roentgen therapy in infantile paralysis are therefore divided even among foreign workers. It should, however, be noted that nowhere among those using the method has there been voiced any distinct opinion against its use, or its harmfulness in the foregoing type of condition. On the basis of what has already been accomplished radiation therapy promises definite amelioration and improvement of certain symptoms, and hence may well be considered as a potent therapeutic adjuvant in the management of anterior poliomyelitis.

GENERAL PROBLEM OF POLIOMYELITIS *

SHIRLEY W. WYNNE, M.D., DR. P. H.
Commissioner of Health
NEW YORK CITY

I accepted the invitation of your society to speak tonight with a great deal of pleasure because it would give me an opportunity to thank you for the splendid co-operation which you gave the Department of Health during the recent epidemic. We can look back over our experience of the summer with satisfaction because the Health Department, the individual physicians and the various medical societies co-operated wholeheartedly in meeting the problems of the epidemic and, as a result of that close co-operation and mutual understanding, the epidemic was more effectively handled than the previous one in 1916. It is true that at the time of that epidemic, we were more or less unprepared. This year, at least, we were on our guard.

When the increase in the number of cases reported indicated that an epidemic was forthcoming, the Presidents of the Medical Societies of the five counties were asked to meet with the Advisory Committee of the Department of Health. The committee met the following afternoon, a message to the doctors of the city was prepared, printed and delivered within twenty-four hours. The Advisory Committee met at frequent intervals during the summer. Subcommittees were designated to study the various problems of the disease, its etiology, treatment and pathology.

I am glad to take this opportunity of expressing, publicly, my gratitude to the members of these committees, especially Dr. Simon Flexner, Dr. M. J. Rosenau, Dr. Aycock and Dr. Frederick Tilney who gave unsparingly of their time, nor can I omit to mention the promptness with which the mayor made available funds necessary to employ additional nurses and doctors.

The value of serum, convalescent or horse, has, up to the present time, not been definitely determined. Early in the epidemic it was arranged that some of the cases would not receive serum because they were admitted to the hospital too late, that early cases would receive convalescent serum and a third group receive horse serum. When the results of the three methods of treatment have been tabu-

* Read at the Seminar conducted under the auspices of the New York Physical Therapy Society, October 7th, 1931.

lated, it is hoped that we will have a definite answer to our question. Inasmuch as about 85 per cent of the cases have been hospitalized and, therefore, under constant supervision and observation, the results of the study should be conclusive.

While it is generally considered that the disease is spread by contact infection, there are still those who believe it is transmitted by an intermediary source and still others who believe that food may be the medium of its spread. Dr. Flexner has been, and is, carefully studying the etiology of the disease and we are hopeful that if the method of infection is not discovered, at least many of the suspected sources will be definitely eliminated. The Department of Health assigned a group of trained inspectors to visit the districts where the incidence of the disease was highest to inspect the sanitary conditions of the food supply. Physicians of the Department visit the homes where cases occurred in order to obtain an accurate epidemiological history. The pathology of the disease is being studied in several of the laboratories, Dr. Douglas Symmers supervising the work in the laboratories of the City Hospitals.

You will recall that early in the summer, Dr. Montrose T. Burrows published an article in which he stated he believed that it was a disease of lymphatic tissue and not of the nervous tissue; that the infection took place through the intestines and when the lymphatic tissue in the perivascular spaces of the central nervous system became involved, paralysis developed. Because so large a percentage of cases have been hospitalized, it will be possible to secure sufficient number of autopsies to prove or disprove his theory as well as to study the entire pathology of the disease. Because we have had this splendid wholehearted co-operation, I am hopeful that out of this epidemic will come some definite knowledge that will be helpful to us in the future.

The immediate problems connected with the care and treatment of the acute cases has practically passed. We now face a problem of equal importance and one that will be of long duration, the problem of aftercare. In the previous epidemic, because of the lack of knowledge on the part of the public, many children, whose condition could have been improved, were made worse by improper treatment at the hands of misguided parents and quacks. At this period, the physicians, themselves, have a better understanding of the after-treatment and there is every reason to believe that those children who were left with paralysis after their disease will be saved much of the deformity that was seen after the 1916 epidemic.

Each one of the five county medical societies have called special meetings to discuss aftercare so that there is no excuse for a physician not being familiar with the principles of aftercare if not with the details of technique.

During the epidemic, rumors were rife that a large percentage of cases reported as poliomyelitis were not poliomyelitis. I believe that rumor is absolutely unfounded. Amongst the cases hospitalized, practically all of them in addition to positive spinal taps, showed definite weakness or paralysis of muscles or muscle groups. Another rumor, frequently heard, was that many cases were not reported. From the very beginning of the epidemic, nurses of the Department canvassed the districts where the disease was prevalent, and altogether approximately 14,500 were visited. But five cases of poliomyelitis were found. In four of these cases, the diagnosis had not, as yet, been confirmed so that in only one had the report been intentionally withheld. That is a record, I think, the medical profession may well be proud of. Another encouraging fact was disclosed by this survey. Less than twenty (20) children who were ill were not already under the care of a physician. In 1916, a similar canvass disclosed a number of unreported cases among a large number of children who were ill without competent medical care.

I think we may rightfully claim that the educational work carried on by the Department of Health and the Medical Societies has been effective and at the time of sickness, parents promptly call a physician.

Your meeting tonight, is devoted to the discussion of aftercare, a problem of the utmost importance to children who have been afflicted.

In closing, I desire to again express to you my sincere appreciation and the appreciation of the staff of the Department of Health for the wholehearted co-operation that you have given us during this very trying period.

Discussion

Dr. Maurice M. Pomeranz (Hospital for Joint Disease), New York City: Doctor Galland's pa-

per admirably describes the physical treatment of anterior poliomyelitis. He has had vast experience in the treatment of this disease, and what he has to say relative to it is a product of this experience.

He mentioned irradiation as a form of physical treatment and I would like to say a few words about it since it has not received the attention it deserves. Some years ago, during the last epidemic, we undertook at his suggestion the treatment of many cases by irradiation. Our results were so gratifying that we have frequently employed this method, particularly where hyperasthesia and muscle spasm were prominent symptoms.

The method of administration is extremely simple and is briefly as follows: Antero-posterior and postero-anterior exposures are administered to the involved segment of the cord once per week, treating both areas at one sitting. Approximately ten to fifteen per cent skin erythema dose is applied to each area. In severe cases a total of six to eight treatments are given, whereas, in the milder cases relief may be obtained in one or two treatments. The total irradiation administered depends solely on the physical effect of the treatment. Treatment is persisted in until the hyperasthesia and muscle spasm have completely subsided. Curiously enough and judging solely from the radiation standpoint, patients affected during the previous epidemic require more treatment than those in the more recent, and now declining, epidemic.

I have been asked in the past to explain the effect produced by irradiation, particularly regarding the mechanism involved. I am unable to state definitely just how the effect is produced. Personally, I believe it is due to the action of the x-ray on the autonomic system. It is conceivable, of course, that the results represent a radiation effect on inflamed tissue. Radiologists frequently employ the x-ray with beneficial results in boils, carbuncles and in cellulitis. Is it a constitutional effect as a result of the indirect action of chemical substances in the nature of foreign protein or alterations in the ion content of the blood? I do not know, and cannot answer the question until radiologists themselves agree on the nature of the mechanism involved in obtaining radiation effects.

X-ray treatment of anterior poliomyelitis where hyperasthesia and muscle spasm are dominant symptoms appears to be justified by experience gained during the last two epidemics.

Dr. Mary L. H. Arnold Snow (New York City): Dr. Wynne and the Department of Health are to be congratulated on what has been accomplished in the interests of anterior poliomyelitis.

Dr. Galland spoke of the treatment of poliomyelitis by x-ray therapy. X-ray therapy has been used for a number of years abroad, especially in France by Bordier[1] in the treatment of anterior poliomyelitis, with very good results. One of the most marked effects of the x-ray is its contractile effect, and the pathology, as presented, is that of an inflammatory condition with all of its sequelae including swelling. The x-ray will diminish the size of the swelling and in turn relieve pressure and consequently the pain. Dr. Galland's cautions are to be considered and emphasized, for it is undoubtedly true that in the past many hundreds of patients have been permanently disabled through over-exercise of the muscles beyond their strength. Over-exercising has been done especially with the use of the sinusoidal current, when the technician wished to see a muscle move in order to feel that she was obtaining a desired result, so the muscle was worked beyond its strength, in consequence of which it was overtaxed and never recovered its normal tonicity and activity.

In considering the use of Physical Therapy in the treatment of poliomyelitis, let us first note the premises—the premises as to action involved —inflammation and its sequelae—circulatory disturbances, hemorrhages and edema. Those are the conditions with which we have to deal.

Drs. Peabody, Draper and Dochez observed that the probable portal of entry of the disease was in the upper respiratory tract as the upper nasal cavities communicate with the meninges "by means of the lymphatics which pass outward with the filaments of the olfactory nerve." The virus is credited as probably making its entrance by these lymphatics. Dr. Burrows has recently written a very interesting and enlightening article relative to the disease in which he emphasizes enlargement or hyperplasia of some or all of the lymphatic structures of the body, but when his findings are compared with the early writing of Drs. Peabody, Draper and Dochez, there is no great difference. The first change in the nervous system is hyperemia and a collection "of small mononuclear cells, probably lymphocytes, in the perivascular lymph spaces surrounding the blood vessels of the leptomeninges." The lymph in them communicates with the cerebrospinal fluid. There is a general lymphoid hyperplasia. There is hyperemia, infiltration, exudation, and later degeneration. A marked exudation will sometimes form thick collars around the blood vessels, and on the inside of the vessels there may be hemorrhages and edema. All depend on vascular changes. There may be constriction of the blood vessels. Constriction causes anemia, and pressure and anemia lead to degeneration and, when prolonged, to necrosis. There is inflammation with its attendant sequelae. In respect to the lymphatics, bacteria and their toxins are absorbed because of the capillarity of the lymph stream and they enter in order, the lymphatic spaces, capillaries, vessels and glands. Bacteria may also reach the lymph stream "by penetrating the walls of the lymph channels." The lymph has a bactericidal action and the excitants are destroyed in the glands unless the bacteria are overwhelming in numbers of virulency when inflammation arises. The infection of the glands may be of hematogenous origin. However, infection of the lymph glands is found in conditions other than poliomyelitis. Attention is called to the relation of the blood supply to the part affected. There

1. *American Journal of Physical Therapy*, **2**: May, 1925.

are marked vascular disturbances. This is most noticeable in the cervical and lumbar enlargements of the cord, and in the anterior horns of the gray matter—parts receiving the greatest blood supply.

Fever, pain and paralysis, clinical symptoms, represent a condition of "congestive infiltrations particularly marked in the meninges of the spinal cord, sometimes involving the meninges of the brain and the substance of the spinal cord." The first indication is to remove the cause of pressure. This pressure paralysis is relieved by the use of radiant light and heat of the lower frequencies. Radiant light and heat warms the parts, induces relaxation, relieves the pressure, the pain, hyperesthesia and the tremor. It also relaxes the muscular spasm of which Dr. Galland spoke. It can be applied immediately at the commencement of the disease without delay and without disturbing the patient or interfering with any other treatment. The demands of inflammation are the relief of circulatory stasis and the establishment of proper drainage. "Increase local resistance and promote the elimination of the infiltration." Radiant light and heat induces hyperemia thus increasing nutrition, metabolism and phagocytosis, thereby raising the resistance index of affected areas. It favors the removal of toxic wastes and germs from the affected parts unless induration interferes with the blood flow. As the late Dr. William Benham Snow noted, "it limits the process of infection, lowers peripheral temperature and stimulates vital processes to greater energy." It relieves the bronchial accumulations and stimulates the heart and respiration. It induces hyperemia as far as it penetrates, and the degree will vary with the patient's skin color and tolerance, volume of radiations and length of treatment. Radiations of longer wave length and lower frequency have greater penetrative powers. Kellogg believes the penetration to be six inches, but Pryor says sunlight penetrates ten inches. "The thermic effects of radiant energy derived from various sources arise from its transformation into the lower frequency of heat vibrations in the tissues and are effective as far as they penetrate." The general effect is body warmth, perspiration is induced and fever broken. Disappearance of the fever is coincident with the formation of antibodies. Radiant light and heat also accelerate secretory and excretory functions, affect blood clotting time, increase the number of red blood cells, and induce marked clinical effects with sedation favoring the patient's rest. Luminous radiations have actinic effects—though not so marked as those of ultraviolet rays—they are inhibitory to bacteria, sensitive to light.

A still more effective agent for relieving pressure paralysis is the static wave current. It can and should be applied early. The static current is a constant current of high voltage and very low amperage. Overcoming skin resistance, it causes "independent muscular contraction of the mass of cells." It removes infiltration and prevents the deformities from which the patients suffer, deformities that follow untreated inflammations. The static wave current acts mechanically removing stasis, promoting circulation, overcoming muscular spasm and increasing the metabolic processes as noted by Prof. Steel [2] in his report. Dr. T. Harris Cannon in the Committee Report on Static Electricity noted an increase in hemoglobin and in the red blood count. The patient's powers of resistance are raised, a factor stressed by Dr. Aycock.

The late Dr. William Benham Snow, in 1900, at the suggestion of Dr. Mary Putnam Jacobi, used the static wave current in the treatment of a case of infantile paralysis which had been treated in Dr. Landon Carter Gray's clinic for seven weeks. There was complete paraplegia, the toes of one foot only showing reflex response. After six treatments with the static wave current applied by means of an electrode over the lumbar region, the child could move ankles and the knee and the hip joints.

Another case, worthy of mention was that of a physician's daughter. She had been given up by attending physicians. Dr. Snow gave her a 40-minute treatment with radiant light and heat, using a 500 candle power lamp over the whole body, followed by a 20-minute static wave current treatment over the lower end of the spine. The child was then returned to bed. In three hours she awakened bathed in a dripping perspiration, which marked the turning point. The moist rales had disappeared from the lungs, as also the fluid in the throat. This child has since grown to beautiful womanhood and is a graduate of Bryn Mawr.

In 1916, Dr. Snow treated about 75 cases of poliomyelitis in Bellevue Hospital at the request of Dr. Reginald Sayre. The use of woolen stockings was instituted and more blankets were requested, as these children suffered from cold extremities. Radiant light and heat were administered treating two children at a time, who were placed under a canopy with their heads in opposite directions. The static wave current and the sinusoidal were also used. "The progress of improvement was very satisfactory." Dr. Frederic deKraft, Dr. Edward A. Titus, Dr. Peckham, Dr. Lucy Osborne Wight, Dr. Yates, Dr. A. B. Hirsh and many others have used these methods with marked success.

Physical Therapy does not accomplish the impossible. After marked degeneration, tissues cannot be revivified. What Physical Therapy does do is to remove stasis, increase circulatory activity, promote drainage, and increase metabolism, thus hastening repair.

The static wave current is applied by means of a spinal electrode, 1 or 1¼ inches in width, and of suitable length to meet the requirements of the case, as to the parts affected, upper or lower extremities or both. If both extremities are affected, a long spinal electrode is used, covering both cervical and lumbar portions of the spine. We have employed the static current for very

2. Matthew Steel: A Study of the Influence of Electricity on Metabolism. *Amer. Jour. Electrother. and Radiology*, April, 1916, P. 192, May, 1916, P. 243.

young children, even under one year of age. The child lies on a chair. The electrode is placed in position and tied on with a gauze bandage. A sheet is then placed over the patient from the armpits to the thighs and securely tied. The electrode is connected to the positive pole. The negative pole is grounded. A long spark gap is used, the minimum being six inches. Treatment is given for twenty minutes.

Diathermy is another physical agent of value in these conditions in that it induces hyperemia and phagocytosis. The status of pyretotherapy as also of the x-rays is as yet not established. Galvanism improves the nutrition of the parts as does also mechanical vibration.

MacAusland emphasizes the prevention of deformity. The factors concerned are ligamentous tissue contraction, habit posture, the favoring of comfort, static disturbance, and gravity. Keep the limb in correct anatomical and functional position, but above all treat the inflammation, lessen muscle tension, overcome muscle spasm, and relieve the pain and tenderness. Another writer states that after tenderness has ceased, active treatment should be introduced, "the sooner the better." Why not treat the tenderness early and eliminate it? The use of radiant light and heat is indicated—the x-ray and diathermy are also of value. Another writer advocating the use of massage observes that the mother should be taught to massage the child so that no time be lost. Time is being lost while the mothers are learning. Treat the condition from its beginning. The earlier the treatment is started, the better.

Dr. Aycock stated that we have lost sight of the disease *per se* by focusing on the sequelae. We are still pursuing the same course when we overlook the treatment of the inflammation, the first pathological change. Treat the inflammation early—immediately—and do not let it run rampant, resulting in sequelae which may take months to treat, or from which the patient may probably never recover.

Summary

Special physical measures may be used at the onset of the disease. A favorable prognosis varies in degree proportional to the time of the institution of physical measures in the treatment. No other treatment as serum or drug therapy is contra-indicated by its use. In anterior poliomyelitis, infection with resultant inflammation and its sequelae are presented. Circulatory stimulation, drainage and the raising of the patient's powers of resistance are the three cardinal points to be considered. Radiant light and heat induces hyperemia, thus increasing phagocytosis, nutrition and metabolism. It makes for the patient's comfort because of its sedative action. The virus is susceptible to light.

The static wave current has a marked mechanical contractile effect. It relieves stasis, muscle tension, muscle spasm, and promotes drainage. Over-exercise should always be avoided. Galvanism and mechanical vibration improve nutrition. The sinusoidal current, manual evercise or hydrogymnastics improve activity. The x-ray has a marked contractile effect on the lymphatic tissue.

Physical Therapy does not accomplish the impossible. Its employment is limited by many factors, just as in the use of drugs. Its selective adaptability will depend on the physician in attendance, and, as in surgery, the results are dependent on judgment, skill and technique. But in all cases, likewise as in surgery, the earlier the treatment, the better the patient's chances of recovery.

References

1. *American Journal of Physical Therapy*, **2**: May, 1925.

2. Matthew Steel: A Study of the Influence of Electricity on Metabolism. *Amer. Jour. Electrother. and Radiology*. April, 1916, P. 192. May, 1916, P. 243.

Dr. Harry Eaton Stewart (New Haven, Conn.): There are many points of interest in the diagnosis, and the early and after treatment of poliomyelitis.

In the early checking up of the paralysis the back is of greatest importance. The existence of a mild degree of scoliosis is easily overlooked. Of the many signs which assist in the diagnosis of this condition, forward flexion of the spine is the most dependable in mild cases. A prominence on either side of the spine when flexed indicates a curvature to that side in the region in which it occurs.

In regard to the prognosis, Dr. Galland mentioned two years as being about the limit of treatment time. We found many cases of old poliomyelitis in the army which responded to treatment a number of years after the disease. The adequacy and persistence in treatment would seem to be as important factors in the prognosis as the elapsed time since the disease. Briefly, a complete and adequate régime of after-care treatment requires:

1. Increase in nutrition produced by some form of external heat, and diathermy for deep heat.

2. Local stimulation to the muscle fibers by sinusoidal, wave galvanic, or when adequate response is present, faradic. Interrupted galvanic, accurate for testing, is too harsh for treatment use.

3. Re-educational exercises: resistive, active or assistive in type. These require special attention and co-operation of the patient.

There is little if any value to massage and passive motion which have been so greatly used in this condition. The great care must always be not to fatigue the weakened muscles.

Dr. A. Bern Hirsh (New York City): I want to emphasize two significant facts brought out this evening. One is that the x-ray appears in discussion of treatment of the disease for the first time, here in New York. Then, again, Dr. Arnold Snow referred to 75 cases of poliomyelitis treated successfully by radiant light-heat in the acute stage by the late Dr. William Benham Snow, and I happen to know that this original

modality was introduced by him during the poliomyelitis epidemic of 1916 on those 75 cases in Bellevue Hospital. Therapeusis of the acute stage of the disease has until now been rather of a negative nature so that it is, indeed, regrettable that this relatively large experience was slighted or lost sight of by those in charge of such patients—that this harmless, painless technic, interfering in no wise with the bodily rest so essential for that stage, should not be applied in every case.

Another fact, shown this evening, brings added satisfaction to those familiar with advanced methods in lesions of this region: In this building, before sections of the Academy, speakers have cited cases within the past year in which direct favorable action on the cord was obtained in other serious conditions by resort to diathermy. In connection with (1) the valuable effects of x-rays applied over the cord, as detailed by several essayists this evening, (2) the successful use of diathermy to this area and (3) the reported favorable results from the static wave current passed through this tissue, physicians must realize that older concepts of treatment of certain spinal cord affections are in urgent need of revision.

Dr. Richard Kovács (New York City): I shall confine my remarks principally to the value and technique of electrodiagnosis in infantile paralysis.

Before outlining any plan of treatment in infantile paralysis the existing muscular power should be carefully examined and graded. One method of doing so is by testing muscle action against gravity and outside resistance; the other is by electrodiagnosis, testing for the reaction of degeneration by the faradic and galvanic current, or, still better, by the modern condenser method. This is the more accurate method.

Electric testing enables the physician who is skilled in its technique and interpretation (1) to express quantitatively the extent to which the muscles are affected, (2) to make a prognosis of the improvement to be expected, (3) to select the most appropriate form of therapy.

The simple galvanic and faradic test, if properly charted, furnishes us with a picture of the gross anatomic condition of the weak or paralyzed muscles. Those without RD will recover spontaneously or the recovery will be sped up by appropriate therapy. Those with RD may show varying degrees of affection and should receive treatment as early as feasible.

The condenser method of testing consists of applying low voltage condenser discharges of varying duration for the measure of the degree of excitability of the individual muscles. It is less painful than the ordinary faradic and galvanic test, and we find little difficulty in applying it to children 2 or 3 years of age. Response to the condenser method of testing is measured in microfarads, the measure of capacity. In muscles with reactions of normal type, condenser capacities of from 0.01 to 0.08 are required. Such muscles as a rule respond to faradism. Partly degenerated muscles require from 0.09 to 0.90 microfarad, and fully degenerated ones 1 or more microfarads.

Electrical testing done by experienced operators is rarely painful. Even young children can be tested without much crying, once they are coaxed over the preliminaries of their unusual experience. It is fortunate that the greater majority of muscles are weakened rather than paralyzed, and precise effective and intelligent treatment enlarges greatly the field of possible complete recovery.

Dr. Heinrich F. Wolf (New York City): Diathermy in poliomyelitis was, so far as I know, first used by Geyser, who was a member of this society. I used this method many years ago, but the number of cases that I had occasion to treat was not sufficiently large to warrant my making it public. As we in our clinic in Mount Sinai Hospital are dependent on referred cases, it becomes obvious that, with the skeptical attitude of physicians and orthopedists towards physical therapy, we would only have a limited amount of material of poliomyelitis cases.

I remember, however, among those cases one, a child, six years of age, who was referred to us a year after the onset of the paralysis. According to the opinion of the orthopedist who referred the patient, the condition was stationary. The child, on admission to our clinic, could hardly stand. The improvement started immediately and kept up for four weeks. She was discharged after six weeks with fairly good function as no further improvement could be observed after four weeks.

I have seen some less striking cases since then, but I do think that one cannot expect results in more than 20 per cent of the old cases.

A few weeks ago a young girl of eleven was sent to me by Dr. Karelitz. The child had been attacked by the disease two months ago and had made fairly good progress. Still, she was not able to walk. Two weeks later she could dance a jig. I don't question that this child who had, outside of a general weakness of the muscles, only a paresis of the extensors of the toes and the tibialis anticus, would have gotten well without treatment. But she surely would not have made such a spectacular recovery.

In my opinion diathermy has a special field in the treatment of anterior poliomyelitis. It should be applied as soon as the signs of inflammatory reaction have subsided. I also believe that we are not entitled to experiment and should give to the patients the benefit of this treatment even if we have the right to expect recovery any way.

First, the recovery may be hastened in many instances, and secondly, it would be wrong to wait until all other methods had failed. I admit that the statistics might become misleading, but the patient's welfare is more important than the statistics.

I believe that one should employ x-ray therapy in those cases which show marked sensory disturbances. But the diathermy should be used at once, as soon as the irritation has subsided. The results of the diathermy treatment show themselves quickly or not at all. A patient who does

not show an improvement within two weeks I should consider not amenable to treatment.

As to the dynamic of the action, we have to assume that diathermy produces a hyperemia in the spinal cord which brings about an improved nourishment of the damaged cells and gives them a better chance to recover.

Dr. Jerome Weiss (New York City): We do not get the acute cases at our hospital. We get them soon afterward. We have tried diathermy in the treatment of these cases, although not in this present epidemic. In previous experience, the results have been good, although not outstanding.

I feel that there is general misunderstanding as to the uses of subminimal sinusoidal current. We should have a definite knowledge as to the amount of current that will give a contraction and I feel that we should try to keep the current below that amount, that is reduce the current until there is no contraction. While it may seem useless to give a treatment without any result, such as a contraction, that is the theory on which we have been working and our patients seem to be getting on very well.

I should like to mention the fact that most of the children, before becoming ill, have been very active. They are then taken to the hospital and are deprived of all outdoor benefits. When they are taken out of the plaster shells they should be put under the ultraviolet rays for a few minutes each day. We should restore some of the important sunlight which they would have gotten under ordinary circumstances. Getting some color into their faces and on their bodies is certainly worth while and is very essential to these patients.

Dr. Harold D. Corbusier (Plainfield, N. J.: I have been very much interested in these papers, and feel that they are quite timely, because too little detailed care has been given to the after care of "polio" cases. They are usually well cared for in the acute stage, and in the very late stage, but there is an intermediate period of great importance which I feel has been too little considered.

The question so often is asked us, "When shall we start after-care, physical therapy and what-not?" It is extremely difficult to make a general rule. We have seen in print from, time to time, a more or less positive statement regarding the time when after-care should be started; two weeks, four weeks, etc., after acute symptoms have subsided. We must remember, however, that every case is a law unto itself. We cannot state any definite time as to when to begin such treatment; it depends upon the symptoms of each case. However, I think it wise to call the orthopaedic surgeon earlier than has been the custom, because he can usually make valuable suggestions regarding the prevention of deformities and the care of weakened muscles. It must be remembered that muscles which have become weakened require careful treatment, as well as those which are actually paralyzed. Nearly all the cases which I have seen in this epidemic have required early attention in this direction. Muscle re-education is extremely important, but it must not be done too soon. We must be extremely careful.

I think we should avoid drugs as much as possible, even for allaying the pain and tenderness. These symptoms can be overcome, as a rule, much better by the use of heat from the infrared lamp applied to affected parts, and, even before the fever has subsided, change of position and support of limbs by means of pillows may be called for. Heat and careful effleurage are also means of inducing sleep, thereby overcoming the nervous symptoms which often appear. After the acute symptoms have subsided, radiant heat should be continued, and it is probable that ultraviolet radiation has a beneficial effect. When the time arrives for massage and muscle re-education, radiant heat should be administered before each treatment.

Naturally, one should proceed with caution in attempting the introduction of active exercises. It is better to do too little than too much. Young patients are eager to demonstrate their ability to move legs and arms as soon as pain has subsided, but these attempts should be made under direction only. No testing of ability at weight bearing should be permitted until the leg muscles have regained their tone, and been given passive, resistive exercise.

If there is a tendency to pronation of the feet, or "foot drop," the feet should be properly supported before weight bearing is attempted. It is not necessary to try weight bearing in order to test the weakened leg muscles; their condition should be determined by other means before the patient is permitted to stand. I am speaking now of both muscle groups which have automatically recovered from actual paralysis, and those which have not been paralyzed, but which have lost their tone from the effects of the disease. The same sort of care should be observed regarding the use of arm muscle groups. These should never be tested by trying to see how much weight can be lifted, or how great a pulling force there is—in other words, an affected muscle should not be tested by trying to discover its maximum efficiency; give it time and careful treatment by yourself, if you know how, or by a well trained technician. Muscle testing with the electric current should not be undertaken too early—on an average not under two months.

When groups such as the abductors of the arm and the dorsal flexors of the foot, are involved, they should be supported by means of the lightest possible sort of splints, arranged so treatment can be applied. When such splints are removed temporarily the part should be supported to prevent stretching of the muscles. It is rarely necessary to apply plaster of Paris splints if proper treatment has been instituted. In extensive back involvement, a plaster bed may be advisable, and sometimes moulded plaster splints are of value for the limbs. These should however be applied so as to permit treatment of the affected parts.

When paralysis persists, then the use of the sinusoidal current, along with massage and mus-

cle training, should be tried. Here again we must not over-do, but proceed gradually and be satisfied with even slight response in the beginning. No rule can be laid down regarding the time when electrical stimulation should be begun, but it should never be attempted until pain and tenderness have been absent for at least two months.

The use of "swimming" exercises is of value, but the patient should not be left to try any sort of exercise. All work under water must be under careful supervision, and done, not as a sport, but with a positive purpose in view.

There is not sufficient time to discuss operative procedures in the late cases, but there are many operations of a stabilizing nature which should be performed when other means have failed.

Dr. Frank T. Woodbury (New York City): I believe that physical therapy can offer certain very definite and rational measures to the treatment of acute anterior poliomyelitis. First as to prophylaxis. Since we are agreed that the nasopharynx is both the port of entry and the site of infectivity, attempts to sterilize the mucosa and reduce the catarrhal discharge are indicated. The patient requires local lavage with antiseptic solutions, and physical therapy offers the sterilizing effect of photochemical rays applied by suitably fashioned quartz applicators and also by the chemical ions administered by means of the electrolytic direct current. Local penetrating heat from photothermal lamps and from high tension, high frequency currents and the decongesting effects of rhythmic high tension charges from condenser electrodes energized by the Holtz or Wimshurst electro static machines are good adjuvant measures since they relieve annoying symptoms, such as difficult nasal breathing and active catarrh.

General phototherapy baths containing all the solar spectral frequencies improve the defensive forces of the body and are also sedative.

The family physician could do a great deal of good if he would give prophylactic treatments to all of his young clients.

In the presence of an acute case, physical therapy suggests that we attempt to put out the fire at once. To procrastinate until the acute symptoms subside, is like waiting until the fire is over and then trying to salvage something from the ashes. The seat of the fire is the inflamed cerebro-spinal tissues. There is passive congestion due to an acute edema of nerve substance and meninges with attending petechial hemorrhage. We must not overlook the fact that it is the substance of the medulla and cord and the posterior as well as the anterior horns and the nuclei of the Gasserian, the ophthalmic and sympathetic ganglia which bears the brunt of the virulent attack. From these conditions all the other signs and symptoms of the disease arise. Were there no nerve tissue inflammation, a true central neuritis, we would not see the paralysis of voluntary muscles, the failure of respiration, the accumulation of mucus in the bronchioles, the intestinal disturbances, the hyperesthesia. As a matter of experience we have many cases unrecognized because of absence of muscular paralysis.

Physical therapy offers and urges the earliest use of the high tension rhythmic condenser charges (called the Morton wave) applied by electrodes reaching from occiput to midlumbar region as the most powerful, deeply effective and painless decongestant obtainable.

Our experience has taught us that individual nerve cells attacked by the virus die and disintegrate leaving a cicatrix to mark where the body lay. Other cells may withstand the lethal effects of the virus only to be embarassed by passive congestion and increasing oedema and so be in danger of death by starvation and by pressure. Why not help them before they give up? Our method of expectant treatment in which we hope that some cells will survive and that we can reestablish communication through them and so restore muscular power is a form of therapeutic nihilism not worthy our present scientific standing. The longer we wait to give our aid the fewer will be the cells which we can resuscitate, because inflammation produces scar tissue, and the stranglehold of scar tissue especially in the spinal nerve substance is at present beyond our powers of removal.

General thermotherapy of the body is sedative, relieves pulmonary congestion, quiets intestinal disturbances and, applied to the muscles, improves circulation and nutrition. As a result, rest and increased nourishment are secured. The photothermal lamps and the high frequency currents as well as the electromagnetic treatments by autocondensation and the new radiotherm are to be preferred to hot water baths or hot packs.

Mechanotherapy of paralyzed muscles is given by extension with counter weights, immobilization by splints or sandbags and posture by pillows. Artificial respiration by means of the Drinker cabinet are well known for saving life in respiratory paralysis. No other method of exercise is advisable until the spinal inflammation subsides.

If the case is seen after the subsidence of the acute symptoms physical therapy recommends the use of deep heat to the spine and the decongesting Morton wave. In addition, voluntary exercise in swimming pools or with gymnastic apparatus or with vehicles propelled by arms or legs and also directed occupational therapy are excellent. Involuntary exercises with various agents as the static induced current of Morton, the rhythmic surging sinusoidal and the surging faradic have their appropriate places. Involuntary motion by instrumental and manual massage are also indicated. Let it distinctly be understood that by exercises we gain nothing except improved circulation. The return of muscular power rests entirely upon nerve cell recovery. For this reason physical therapy pleads for a chance to exert some influence upon the spinal cord with a view to resuscitating as far as possible all viable nerve cells before the case is pronounced static and handed over to the operative orthopaedist for surgical assistance.

Dr. Walter I. Galland (New York City) closing discussion: I want to thank the members for their discussions, which have been very valuable. I have not attempted to enter into the realm of physical therapy. I have tried to outline the orthopaedist's view and, if possible, to correlate his work with that of the physical therapist.

I did not mean to imply that at the end of two years there is no further hope for recovery. If at the end of two years there is residual paralysis the cause should be ascertained and operative assistance obtained if required. If we could save anterior horn cells as has been suggested, by means of physical therapy, it would be a step in advance. We can still do a great deal even after the cell has been injured in rehabilitating the patient, by giving orthopaedic, operative and non-operative care, providing we have the cooperation of the patient and his family.

THE SCOPE OF ELECTROSURGERY IN GENERAL SURGERY *

WILLIAM E. GROUND, M.D., F.A.C.S.
SUPERIOR, WISCONSIN

I approach this subject from the standpoint of a general surgeon. Having done general surgery for many years and being rather interested in electricity as applied to medicine and surgery, I found no great difficulty in acquiring a working technic in this field. Believing heat treatment was best for cancer, I early used the actual cautery of Percy, and when the high frequency surgical currents became available I adopted them also. I have not used the scalpel on any cancer or what appeared to be cancer, for more than a decade. From that point of view it is desirable for the sane or better understanding of the methods involved in the use of high frequency current to clarify the surgeons understanding in regard to nomenclature. To most of the members of this organization the few remarks I wish to make in regard to the terminology in accepted use may appear superfluous, but to the surgeons at large, such clarification is very much needed because of the growing application in regard to the merits of electrosurgery. It is therefore important to lay down fundamental definitions and facts with reference to the principles and practice of electrothermic methods as applied to general surgery. In doing so it is necessary to strip the terminology of all redundant verbiage and confine our exposition to the actual facts associated with its practice.

Nomenclature

To me, it seems only necessary to refer to the high frequency surgical currents as desiccating, coagulating and cutting.

The desiccating current, as its name implies, simply dries or dehydrates the tissue, and is very superficial in action. Its action is obtained from a monopolar type of current and is generated by the Oudin and Tesla circuit. It is a very high voltage and low amperage current, produces a reaction somewhat of the nature of coagulation, differing only in degree of intensity. This is the first type of surgical high frequency current to be utilized and was brought to our attention by Reviere under the name of fulguration. The term "desiccation" was first exploited by Clark of Philadelphia, and we owe it to him for the perfection of the technic associated with its practice.

Doyen deserves the credit of having introduced the term "electrocoagulation." Such a current is of lower voltage but higher amperage. It is sometimes referred to as surgical diathermy because the heating effect is destructive, in contradistinction to medical diathermy whose heating effect is constructive in nature. The coagulating current is used to destroy tissue by means of heat generated within the tissues. When this technic is employed, it is observed that the needle electrode remains cool while the surrounding structures become hot. Electrocoagulation is a bipolar method and requires the use of two visible electrodes, — dispersing and active. One cord is passed from the machine and connected to the large or dispersing electrode fastened to the patient, and the other from the machine to the active or needle terminal to destroy the growth.

The third or most recent surgical current is the cutting, or arc operation. As it was first produced by the radio tube, it was called

* Read at the Tenth Annual Meeting of the American Congress of Physical Therapy, Omaha, Nebraska, October 7, 1931.

"radio knife," but as there are other cutting currents, produced by the spark gap and condenser, the term "radio knife" is not appropriate. This current differs from the diathermy coagulation in that the arc which produces cutting of tissue is of lower voltage and of sustained or relatively undamped oscillations. This also requires two visible poles, but here the current does not penetrate as in diathermy but travels along the surface. The heat generated is very slight, and if the needle is in movement, not enough coagulation will occur to interfere with primary union, although capillary oozing will be prevented and bleeding from fair sized vessels curtailed.

It has been my experience that there is a distinct difference in the cutting quality of the currents activated by the tube and the spark gap machine. The tube machine is the better cutter and the spark gap machine the better coagulator. I have used these machines side by side for several years, in fact ever since their availability, and these conclusions are arrived at automatically.

The term cautery should be limited to thermo production, produced by outside agencies and applied by the hot terminal, such as the actual cautery, the soldering iron, Paquelin's cautery and the purely electric cautery. Although there is a cautery or killing effect in the high frequency, it seems to me our purposes would be better served by ignoring the word cautery where electrodesiccation, electrocoagulation and cutting was intended. Without a clear appreciation of the nature of the agencies with which we are dealing, and how they react on the tissues and how the tissues react to them, there can be no such understanding that is necessary to enable us to evaluate advantages and disadvantages.

I would not have it understood that we have discarded the use of the knife. Far from it. But I do say that most of our surgery has an electric element in it, and electrosurgery is used sometimes where the knife would do, but in the spirit of research we use the electric phase. Where the advantage of the knife is outstanding we use it.

The acquisition of a working knowledge of electrosurgery, requires considerable outlay of money, work and time. The development of a comparative new technic means patience with oneself and with our assistants and the machine.

Advantages of Electrosurgery

First and foremost, the thing that caused the attention of serious minded surgeons to turn to thermo and electric surgery was the waning influence of scalpel surgery to check the progress of cancer mortality. That the death rate from this cause is mounting in spite of the best surgery now available is a fact that is becoming more appreciated. A few years ago I attended a meeting of the British Medical Association at Portsmouth. At this meeting Dr. Herbert Patterson read a paper entitled, "Are our Cancer Results Better than they were Twenty Years Ago?" He concluded that they were not. During the discussion no one actually disagreed with the essayist, but some suggested that he should not have spoken so plainly. Among those participating in the discussion was Mr. C. P. Childe, who was active in cancer propaganda. I imagine that there are few of us who do not feel depressed at the poverty of our success when we reflect how small is the number of cases in which complete freedom from recurrence follows operation for cancer.

But you ask, What better method have you to offer? Perhaps none. If I may be permitted a slang expression it is a "cinch" that the results can be no worse and the chances of betterment are considerable. With this end in view many men who dared get out of the rut or refused to get in one, looked about for something better.

Whatever constitutional background cancer may have (and it is undoubtedly an important factor), it is primarily and for our immediate purposes essentially a local disease to be successfully dealt with by quarantine and surgical removal so far as anatomical circumstances will allow, and after that submitted to radiation by x-ray or radium. So far as I know all agree that the manipulation of a cancer lump or area is calculated to favor dissemination of cancer cells. Cold steel dissection of cancer as it is usually done, is, it seems to me, the most expeditious way of scattering the disease. As an example, recall the technic employed in the removal of a breast for cancer. There is much manipulating, cutting, sponging, tying off and opening up of raw surfaces, and always a considerable loss of blood. Handling and bleeding leads to shock. We are confronted with a procedure that insures less manipulation, that can be made comparatively bloodless, that minimizes and

eliminates tying. The heat of the cutting current seals the raw surfaces and closes capillaries and small vessels, and is in itself lethal to the cancer cell immediately adjacent to the operative field. The more important vessels are picked up by hemostats and the coagulating current run down the instrument, thus sealing the bleeder by coagulation. As a rule the axilla is not attacked unless grossly affected. The palpable glands are disposed of not by digging them out, but by inserting the diathermy needle into the lymphatic enlargement and gently cooking it. The whole procedure compels gentleness. A general anesthetic such as ether or ethylene is not permissable owing to danger of explosion in a flaming arc. We must perforce use some other anesthetic, such as local infiltration or nerve blocking, usually preceeded by some analgesic or narcotic drug. This necessitates gentle manipulation and deliberate work.

Now as to the results. Naturally nothing can be said regarding the final outcome of the individual case as the time is too short and the cases too few to allow definite conclusions to be drawn, but my impression is that our results regarding recurrences is decidedly favorable. We have followed our cases closely. This is not a difficult matter, considering the fact that most of our cases are private, and that we live and work in a smaller city. We know what happens to our patients. But the immediate effects following operation by surgical diathermy are very salutary. In case of breast work there is just as good primary union as with cold steel, less shock and less pain, and in only one case did we have any after hemorrhage to speak of, and that was in our earlier cases, when our technic was lame. The after pain is less owing, I assume, to the obtunding of the nerve terminals by the heat. These arguments hold to a greater or lesser extent for all operations and will not be referred to again individually.

Much can be said in favor of the specific hemostatic effect as applied by the coagulating current through forceps. The field must be fairly dry and the current just strong enough to gently seal the vessel and not burn it through, otherwise a secondary hemorrhage might occur. Some have raised the objection of leaving dead tissue in the wound. This objection seems to me just as applicable to tying with catgut. Here we have dead animal tissue in form of ligature beside the distal portion which has been devitalized and rendered necrotic. Where there is just troublesome oozing, the area is touched gently by a blunt pointed electrode from the coagulator. An objection to most of the electrosurgical machines that I have used is that they will not cut or coagulate consistently in too wet a field. When this objection is overcome and a more concerted action on the part of the manufacturers as regards usable active terminals, at present the big objection, the practical application of this beneficient agency to every day surgery will have been removed. The manufacturers are to be complimented for their zealous work and we are obligated to them. They should however listen a little more to active workers in the field for practical suggestions, rather than shop mechanics.

We have used electrosurgical currents for the removal of wens and other tumorous formations about the head, almost too numerous to mention. Basal cell epitheliomas are most successfully dealt with by the desiccating, or at most, a very light coagulating current. In cancer of the lip it leaves little to be desired. There is nothing like the deformity following the operation of V shaped excision by the knife, results. The comparatively large expanse of tissue removed by electrocoagulation gradually closes in, leaving a surprisingly slight disfigurement. In cancer of the tongue and mouth, electrosurgery is very applicable, controlling hemorrhage, eradicating the disease at the original site as well as the glandular involvements, with the minimum of shock. Leukoplacia has been reported as cured by desiccation.

In skull fractures with brain injuries, where hemorrhage is a factor, electrocoagulation is of great help. Bleeding vessels can be picked up and coagulated through the forceps where it would be impossible to tie. Oozing surfaces can be gone over with the ball-tipped coagulator. Perfect hemostasis can be obtained by these agencies with ease. Following the practice of Cushing, the leading brain surgeons are employing these methods in their work. It solves the bleeding problem and enables them to do brain tumor operations with comparative ease and brevity.

Tonsils

The importance of the tonsils as foci of systemic infection has been pretty well established. It only remains how best to remove them. We all know the many argu-

ments advanced for their removal and non-removal. Enthusiasts in their eagerness to do a thorough operation, have often dangerously encroached upon important parts of the throat, and greatly traumatized its finer functions permanently. Prolonged convalescence not devoid of serious complications in location and remote organs has followed. Of the serious complications may be mentioned hemorrhage, for the relief of which many methods have been devised for its control. Three cases of fatal bleeding following tonsillectomy are known to have occurred in Duluth and Superior during the last year. Having performed many hundred tonsillectomies in my time, I know from personal experience the anxieties connected with the operation. It is said that about one-third of all operative surgery is done on tonsils, and as at least one-half of these are done by the general surgeon, I experienced no compunction of conscience in introducing electrocoagulation as a method of choice for the sterilization and removal of tonsils in my practice. I began about six years ago, during which period we have electrocoagulated over 1000 tonsils. I began very cautiously at first, using the desiccation method largely. Gradually as our experience enlarged and the practical utility of the measure was demonstrated to my satisfaction, I took on a greater variety of cases until now nearly 90 per cent of the adult cases are treated by electrocoagulation. Without going into details I can safely say that this work has been the most satisfactory of anything emanating from our surgery. From the first I have endeavored to follow each case in order to determine the true value of the procedure. One outstanding feature was the riddance from the tonsil of signs of infection even before it was entirely destroyed. The heat seemed to first sterilize the tonsil and become surprisingly small under the mildest treatment. We should not forget that it is not the tonsil that is the menace but the infection in the tonsil, and when the infection is removed we have a better throat even though some healthy tonsil tissue is left. The predilection of certain well known areas of the throat for lymphoid tissue, is evidenced by the tendency to recur after removal. I am often asked, "do you get the tonsils all out?" and my reply is, "yes, just as certainly as by orthodox tonsillectomy." As we employ the fractional method, it is only a matter of keeping at it until all is destroyed. You are all probably familiar with the report of Rhoads and Dick who found that 73 per cent of several thousand tonsillectomized, appreciable tonsil remained or had recurred and that the stumps contained organisms more virulent than is usually found in the original tonsil. The operations in question included the work of some of the best throat specialists. Every operator familiar with electrocoagulation knows what an extraordinary opportunity is his to remove left-over tonsil stumps and exuberant plica tissue by this method.

Major Surgery

Electrosurgery is of great assistance in goiter work by its ability to diminish bleeding. Here the current is sent through forceps as they hang from vessels in the wound. One by one they are picked up and the coagulating currents passed to the bleeding point, thus effectively sealing it, instead of the more time consuming clumsy method of tying. Some of the main vessels should be tied at least until familiarity with the technic has been attained.

Electrosurgery can be made to play an important role in abdominal surgery. The liver can be freely incised without bleeding. The gallbladder in cholecystectomy is readily dissected from the liver in a bloodless manner. It is useful in intestinal anastomosis, gastroenterostomy, and the like, by its hemostatic effect when incising the intestinal wall. The separation of adhesions can be accomplished with safety and ease by the use of the cutting current, supplanted where necessary by coagulation. In appendectomy electrosurgery may be used to a decided advantage. After the effected end has been tied it is cut off from the appendix by the cutting current. The purse string suture is inserted, the appendix is grasped by a small hemostat and clamped down hard so as to crush the mucosa out from under this instrument and thus bring the fibrous and serous coats in apposition. Then a gentle coagulating current is sent through the forceps and the tissues thus sealed, which prevents hemorrhage and leakage, and avoids the necessity of tying the appendiceal stump. The appendix is finally severed with the cutting current, the stump tucked in and the purse string drawn. The heat generated by the current thoroughly disinfects the field and obviates the necessity of using a carbolic applica-

tion, and obliterates the dead space left after using a second ligature around the constricted appendix as is usually done. I have used these currents to produce complete hemstasis in favorable cases of appendectomy. But I must admit I sleep better when I know I have a ligature around important vessels.

I have used these currents in severing the tubes and broad ligaments from the uterus in hysterectomy. I always core out the cervical stump in this way when performing a supravaginal hysterectomy. I do not depend on it for hemostatis, although I have done two Kraske operations without tying a single vessel. Hemorrhoids are successfully coagulated or desiccated.

The radical removal of an hydrocele can be accomplished almost bloodlessly by these currents, and every surgeon knows how bloody this operation usually is.

The removal of specimens for biopsy can be easily and safely accomplished by the cutting current with the loop.

Mr. Sampson Handly, of Middlesex Hospital, London, well known cancer worker and author of a standard book on cancer of the breast, advances the opinion that the electric needle has definitely replaced the scalpel for many categories of operations. In breast and mouth surgery it is indispensable.

Endocervicitis

Gynecology perhaps occupies the greater part of my work, and it is in this field that we have used electrosurgery most consistently and over a considerable time. Fully 75 per cent of our female patients have infected cervices and accounts for most of the backacke and low abdominal tenderness, distress, and leucorrhea complained of. Endocervicitis is a most important factor in pelvic pathology and most resistant to satisfactory treatment. Located at the gateway between the infected vagina and the sterile endometrium, parametrium and peritoneum, it is in a constant state of turmoil for the major part of a woman's life. Through its lumen and its rich lymphatic supply must pass the morbid material, the cause of most of the infectious conditions of the uterus, the tubes, the ovaries and the para-uterine structures. Not only that, but also the cervix is the seat of 90 per cent of all uterine cancers. Like the teeth and tonsils, the cervix may be the seat of focal infections. Recognizing the futility of topical applications, douches and tampons to cure this condition, gynecologists are seeking other means of treatment. A few years ago the cautery was utilized by Dickenson, and proved a great step in advance of other methods. I adopted it at once and achieved remarkable success in the cure of the erosions, but in the higher-up infection the cause of the erosions remained uninfluenced. In fact the leucorrhea and the concomitant pelvic symptoms occasionally appeared to become aggravated. Now what was the explanation? The cicatricial contraction of the outer cervix as the result of the actual cautery caused so much narrowing that proper drainage was prevented. This very fact is at the bottom of a method of treatment which I have been developing in the last few years in order to clear up the cervical infection before touching the erosions. I have noticed that as the upper endocervicitis was ameliorated the erosions had a marked tendency to disappear. How to sterilize the entire length and breadth of the endocervix was the problem. The tortuous racemose glands dip down and tunnel under the mucosa in such an intricate fashion for a quarter of an inch or more, that erradication is next to impossible short of amputation; and amputation greatly impairs the function of the uterus as such. The Sturmdorf or coring operation by knife and scissors, ligatures and stitches was often efficient when done properly, but that was not the case when confronted with an upper cervical infection, and disappointing results followed as a consequence.

Realizing that heat was the best sterilizer, the problem was how to get to where it was most needed,—that is, the upper part of the endocervix. The lower area and erosions were easily cured by the cautery, but the heat in the cautery tip could not be efficiently maintained in the upper cervix. It also follows that the ordinary electro-cautery is cumbersome and the heat from the handles often so perturbs the patient as to make office treatment annoying. Electrodesiccation and electrocoagulation was substituted for the cautery long ago and the results were better and more easily acquired. High frequency surgery is the finesse in cervical work. It is adjustable to a nicety and can be depended upon to administer heat to where it is wanted. Along this line I have devised an endo-cervical electrode that fulfills every requirement. Its simplicity is its only drawback. It is merely an insulated shaft with an exposed bulbous tip of a size to fit the

cervix, and as cervices differ in size so must the tips. The cervical part of the terminal is flexible so that it can easily be adapted to different directions of the cervical lumen. Most of the cervical electrodes for the administration of surgical diathermy are one size, straight, delicate and clumsy in comparison. The one I have constructed is of silver, and besides being the best conductor of electricity is very flexible.

I proceed by introducing a bi-valve speculum. When the cervix is plainly in view it is cleansed, and powdered Vince is placed on a cotton wrapped probe and introduced up into the cervical canal. As this powder moistens it foams and thoroughly removes mucous and pus. An anesthetic solution, consisting usually of a ten per cent cocaine or a two per cent nupercaine, is then introduced into the canal and allowed to remain 5 or 10 minutes undisturbed. The cord leading from the machine is clipped to the vaginal speculum as the dispersing electrode. This simplifies matters and obviates the necessity of placing a pad or plate on the skin of the patient. The active needle or bulb terminal is then inserted high up in the cervical canal and the current turned on until a sizzling noise is heard or felt. The current is turned off and the terminal moved down slightly, when the process is again repeated. This may be done two or three times depending on the sensitiveness of the patient. If there is little reaction the procedure may be repeated in a week or ten days. After I am satisfied that the whole of the endocervix has been treated thoroughly the patient is given a rest for a month or six weeks. In the meantime, it may be well to see her one or two times as she will likely have an increased discharge, perhaps tinged with blood, which is naturally disturbing to the patient. This can be readily relieved by certain topical applications, and is known in our surgery as "the soothing treatment." It is possible that the whole procedure may have to be repeated, but that is exceptional in the average case. The dictum should be: "Go slowly at first. Err on the safe side, if err you must," and most of us "must." Remember, it is not so much the instrument as yourself that counts in the end. Practice on a piece of raw meat or liver until a thorough working familiarity with your machine setting is obtained. A little more current or longer contact will be needed with the larger tips, less with the small tips or needle terminal. Visualize the converging lines of heat passing through the tissues and concentrating at the point of contact of the active terminal, and contrast this with the comparatively dead heat of the ordinary cautery.

When the endocervicitis is well cleared up it is time to cure the erosions. Often by this time however, the erosions are much reduced in size. I have often noticed that this condition, unless the cervix was very hypertrophic and cystic, had all but disappeared. Puncture the cysts with the needle terminal and run a line of electrocoagulation radiating from the external os to the outer rim of the eroded area. Perhaps two or three lines will be needed, particularly if there is much eversion. By knowing how and where to place the coagulation areas, the cervix, however badly deformed and eroded, can be moulded and shaped into a normal appearance. It is a great temptation to begin with the erosions. Do not do it for you will thereby narrow the outer cervical opening, prevent drainage and defeat the purpose in many instances.

As already indicated, most of this type of surgery is done in our office. If the treatment has been rather heavy, the patient should be admonished to keep quiet and lie down most of the time, at least for a day or two, otherwise she will have considerable low abdominal pain and an aggravation of the backache. The vaginal discharge will be increased for a few days, and it will likely be tinged with blood. Rarely is it enough to alarm the patient, but occasionally there is considerable bleeding, hence it is well to inform her in regard to this.

Once in a while a case may be found so aggravated as to require hospitalization; or perhaps the patient is insistent on having the whole procedure accomplished at one sitting, or is too nervous to stand repeated office treatments. This class of patient should be sent to the hospital and, under anesthesia, the entire endocervix is cored out by the cutting current, much after the style of the Strumdorf operation. There is surprisingly little bleeding. If there is a "spurter" it is touched by the coagulating current terminal, or the artery picked up by a hemostat and the current run down the forceps, thus sealing the vessel by coagulation. Oozing surfaces may be gone over by the bulb tipped coagulator.

The wound is packed with iodoform gauze and left for 3 or 4 days, and the surfaces

allowed to granulate. If the manpulations are correctly accomplished the result is almost certain to be perfect, and there is little narrowing of the cervical canal. This I have verified in many cases where the operation has been done a year or more. Scar tissue formation is proverbially thin and elastic after electrocoagulation. If there should be evidence of cervical atresia it is readily overcome by gradual dilatation. Those who use the galvanic current are masters of the situation, for the introduction of a cervical electrode connected to the negative pole will soften up any cicatricial narrowing that may exist.

Conclusion

Electricity has a wide field of usefulness in gynecology, and few there are who can practice this specialty successfully without the use of this agency in some form. Electrocoagulation is being utilized by many gynecologists, but there is no reason why the general practitioner that is, so to speak, electrically and gynecologically inclined, cannot use this very beneficient agency with equal readiness.

ELECTROSURGERY IN RHINOLARYNGOLOGY *

A Solution for the Tonsil, Turbinate and Sinus Problems

LEWIS J. SILVERS, M.D.
Otolaryngologist, Ocean Hill Memorial Hospital
NEW YORK

The unusual and intense interest focussed upon diathermy, both medical and surgical, in the past few years, has been phenomenal. To those of us who have been pioneering in this field during the past decade, it is most gratifying to note the results actually obtained after years of silent endeavor. Many of our most cherished hopes are now gradually approaching fruition. We are at present emerging from an era of radicalism and entering into one of greater conservatism in the realm of operative procedure. A prominent surgeon notes that "Time was when surgery was a matter of craftsmanship. But a limited number of operations were performed; speed, dexterity, and ability to do a finished job in the shortest possible time was the goal every susgeon aspired to reach. Surgery was then an art. Today the art of surgery is degenerating into a highly specialistic assault on tissues and organs of the human body. . . . The crying need of the hour is a return to rational, safe, and sane methods in the practice of surgery in all its branches." Especially does this hold true for our field of Otolaryngology.

A clinical analysis of the results obtained with the various technics now commonly employed in surgical tonsillectomy over a period of five years, has led us to the conclusion that no single technic will necessarily terminate in a perfect tonsillectomy. These findings are fully substantiated by other Otolaryngologists, notable among whom, is my former teacher and professor of Otology at the Cornell Medical College. Writing on the problem of the perfect tonsillectomy, McAuliffe[1] cites the fact that our present day Snare and Dissection technic still falls far short of perfection, even in expert hands. An analysis of the end-results in five thousand surgical tonsillectomies during a period of five years at the Johns Hopkins Medical College,[2] shows recurrence of tonsil tissue in sixty-five per cent of the cases. Rhoads and Dick[3] found that seventy-three per cent of the tonsillectomized nurses entering training at the Cook County Hospital, of Chicago, had remaining tonsillar tissue which carried more pathogenic bacteria per gram than the original tonsil prior to removal. To put it mildly, we have been groping for a surgical technic that will produce perfect end-results and yet obviate many of the hazards, especially in the adult and the organically diseased individual. Electrosurgery comes to the fore here, and permits us to perfect the incomplete surgical tonsillectomy, and to perform a safe and shock-proof extirpation of the tonsils in those cases where radical surgery is contraindicated.

Electrosurgery now occupies a definite place in the field of rhinolaryngology. It is established beyond a question of a doubt, that every

* Read at the Tenth Annual Meeting of the American Congress of Physical Therapy, Omaha, Nebraska, October 7th, 1931.

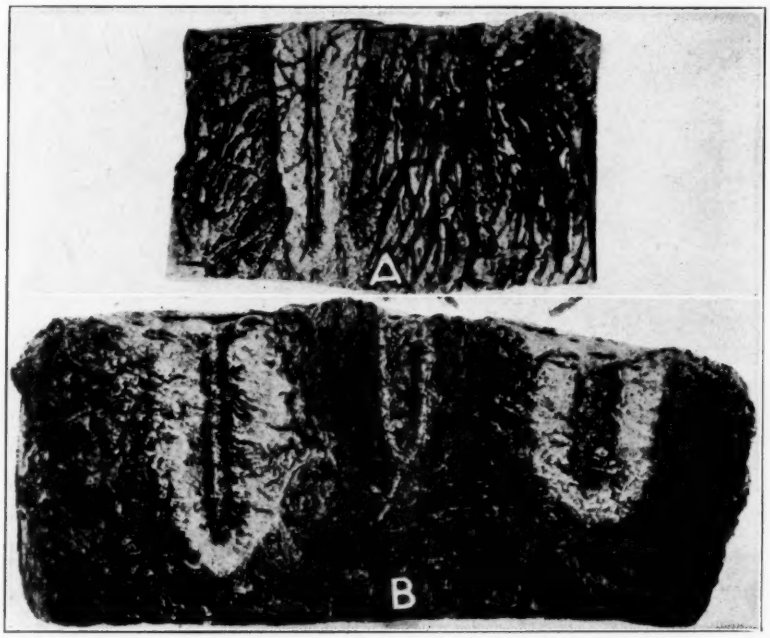

Fig. 1. Coagulation and destruction in situ; sealing of vessels by desiccation deeply and superficially. *A*, treatment of a piece of meat by endothermy; on the right there is a pinpoint area of the mildest desiccation; on the left, the application of 1,000 ma. for half a minute has resulted in moderate coagulation. *B*, meat treated by a heavier current; at the left there is heavy coagulation; in the center is a surface burn produced by the application of a Paquelin cautery for half a minute; on the right appears the result of the insertion of a cold Paquelin applicator which was then given 1,000 ma. for half a minute by the attachment of one pole of the bipolar current (from Wyeth: Surgery of Neoplastic Diseases by Electrothermic Methods, New York, Paul B. Hoeber, Inc., 1926).

vestige of lymphoid tissue that is accessible in the nose and throat may be removed by the multi-stage technic of coagulation modified by desiccation and fulguration. A careful, annual check-up on patients for the last five years has convincingly proven that recurrence is negligible in cases where complete extirpation was effected. Rarely do we find a lymphoid island in the fossae. If present, it is readily destroyed by a single surgical diathermy treatment. The contour of the throat is found normal; the plicae semilunaris and triangularis ominously present and the palatoglossal and palatopharyngeal muscles unscathed. Cicatrices and cicatricial contraction of the pillars are characteristically absent where the proper technic has been executed. Tonsillectomy and adenoidectomy in children are best accomplished by our recognized orthodox surgical procedure under general anaesthesia, and are not to be considered here. It is no longer necessary to enucleate large healthy tonsils and adenoids which may cause mechanical obstruction to breathing and voice. The results of Knox[4] show conclusively the shrinking effect of the Roentgen ray. X-ray should be used in the non-cooperative child. Electrosterilization performed conservatively is usually sufficient in the cooperative child and adolescent individual.

Forbes,[5] in discussing one of the author's[5a] presentations at the New York Academy of Medicine, said as follows: "The contraindications to surgery are overcome in great measure by electrocoagulation. I can show some absolutely perfect cases that have no lymphoid tissue remaining." Apparently, then, the problem is no longer that of removing all lymphoid tissue. That is readily accomplished by care, patience and perseverance. The difficulty facing the beginner in this work is that of removing only the tonsillar tissue and leaving the normal epithelialized structures intact. It is in this regard that trained skill and a thorough knowledge of the minute anatomy of the nose and throat are essential. In performing the orthodox surgical tonsillectomy it matters but little what epithelial structures are removed as long as the pillars and uvula are left *in situ*. In the electrosurgical extirpation of tonsils, however, it matters greatly whether the normal tonsillar folds are coagulated and damaged. Many of the traumatic deformities noted after improper extirpation can be obviated by observing the anomalies in the anatomy of the tonsil.

ELECTROSURGERY NECESSITATES A REVISION OF THE GROSS ANATOMY OF THE TONSIL

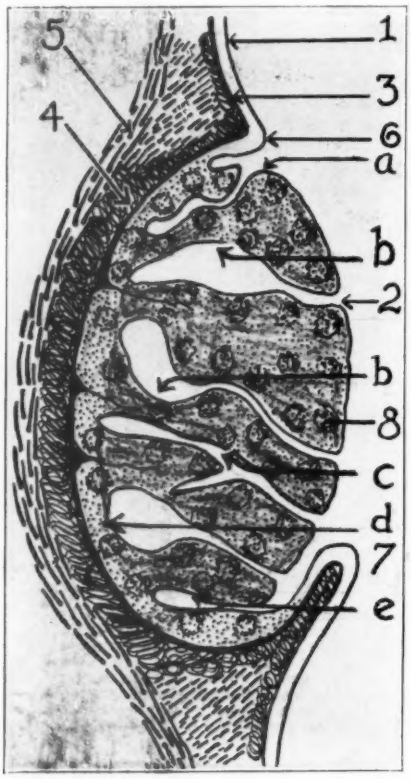

Fig. 2. Cross-section of the right tonsil: 1, epithelial layer of pharyngeal mucosa reflected into crypts; 2, crypts; 3, basement membrane of pharyngeal mucosa; 4, submucosa of the pharynx; 5, superior constrictor muscle of the pharynx; 6, posterior pillar of fauces; 7, anterior pillar of fauces; 8, lymphoid follicles. The needle should follow the crypts if possible; *a*, when inserted in the supratonsillar crypt, the needle is pointed away from the pillar anteriorly; *b*, in the middle of the tonsil, the needle is directed both anteriorly and posteriorly, superiorly and inferiorly; *c*, coagulation and desiccation area; *d*, desiccation only; *e*, when inserted in the infratonsillar crypt, the needle is pointed away from the pillar posteriorly. (From Duplessis, Jean: Indications and Contraindications for Tonsillectomy, in Clin. M. & Surg. **36**:878 [Dec.] 1929.)

It is of paramount importance to recognize the finer epithelial folds: the Plica semilunaris superiorly and the Plica triangularis inferiorly. These folds act as a cradle for the tonsil and account for the painful reactions obtained when they are unduly traumatized.

In dealing with adult tonsils we note a distinct departure from the anatomy of the tonsil in childhood. In the infantile type, surgical tonsillectomy is comparatively simple and less hazardous. The line of cleavage is readily and easily obtained. The vessels cut by the snare in the intra-areolar area just deep to the capsule, permit of more complete retraction of their severed ends and thus prevent free, gaping hemorrhage. In the adult, due to repeated inflammatory reactions, plastic adhesions entirely alter the virginal anatomy of the tonsil. Large, vascular tonsils have as a rule a redundant plica semilunaris above, covering the view of the supratonsillar fossae; a disproportionate, adherent plica triangularis obstructing from view the middle and inferior poles of the tonsil. These normal structures are innocuous and do not require removal. Skillful electrosurgery permits us to remove only that which is detrimental to health and leave the normal tissues intact. It must be emphasized here, however, that the picture of the throat after extirpation by surgical diathermy is entirely different from that of the dissection and snare operation. The normal contour remains unaffected in the former whereas in the surgical operation the pillars atrophy and the redundant folds which hold the tonsil *in situ* are of necessity removed with the organ. We can readily extirpate the lypmhoid tissue behind, above and below these structures; and so rarely require the cutting current to assist us in completely denuding the fossae.

Many of the most appreciative patients have been those suffering from chronic nasal accessory sinus disease, both preoperative and

SHRINKING THE INFERIOR TURBINATES

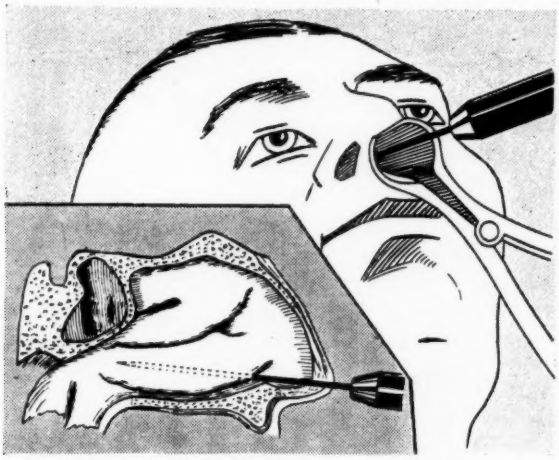

Fig. 3. An illustration of the Beck Technic in reducing the turbinates to normal size, without damage to the normal ciliated nasal epithelium. The needle is inserted deeply into entire length of the corpus spongiosum, avoiding the periostial border by about one millimeter. Superficial coagulation at point of puncture prior to insertion of needle avoids bleeding from large, spongy or degenerate turbinates.

postoperative. The relief afforded by shrinking the turbinates with the author's modification of the Beck technic, permitting freer drainage by suction and irrigation, is truly spectacular at times. Superficial coagulation of the area of the turbinate to be pierced by the Beck needle is first accomplished. Bleeding due to puncture of the cavernous tissue is controlled and frequently avoided by this technic.

Diathermy is a most efficient adjuvant in the conservative treatment of sinus disease. This was confirmed by Brooke,[6] who found that the use of diathermy in sinus infection had shown a degree of recovery that frequently surpassed all expectation. Hollender and Cottle,[7] in their survey of available treatment methods with special reference to physical therapy, showed that in both acute and chronic sinus disease, direct diathermy, properly applied, is the method which thus far has given the most satisfactory results and therefore is a decided advance in sinus therapy. My own experience shows that where the turbinates are reduced to their normal size and proper aeration is permitted, early treatment of the sinuses by diathermy offers the best results. I have cured many cases of chronic accessory sinus disease by this conservative treatment. Postoperative cases having proper egress for the accumulated pus will frequently respond to diathermy with radiant heat and ultraviolet light as adjuncts. Ionization with either zinc or copper is most efficacious in the exudative cases either mucoid or purulent.

Hurd[8] succinctly outlines the various applications of the high frequency current in otolaryngology. Most interesting to the initiated is the electrocoagulation of the tissues heretofore reached most inefficiently by our orthodox surgical technic. Tubal tonsils and lingual tonsils along with postoperative tabs are peculiarly susceptible to the coagulating needle. Lymphoid tissue which is aberrant, invading and harboring an infection in the fossae of Rosenmüller or nasopharynx, is readily extirpated by electrosurgery. Here it might be of interest to note that the author has successfully eradicated many cases of pathogenic mycotic infections of the nose and throat most efficiently by electrosurgery. Persistent strains of actinomycosis treated unsuccessfully by increasing strengths of mercurochrome and silver nitrate over periods varying from six months to one year, were readily destroyed without inconvenience to the patient by our electrosurgical technic.

A most obstinate case of actinomycosis of the posterior half of the tongue and nasopharynx, including the fauces and fossae of Rosenmüller, resisting chemical treatment for almost a year, the patient having traveled from one clinic to another, was recently reported by the writer,[9] in the *New York State Medical Journal.* Thoroughly coagulating the root of each bulbous growth, I was able to eradicate the fungoid invasion in nine treat-

PROPER RETRACTION OF THE PLICAE IS ESSENTIAL TO MINIMAL REACTION

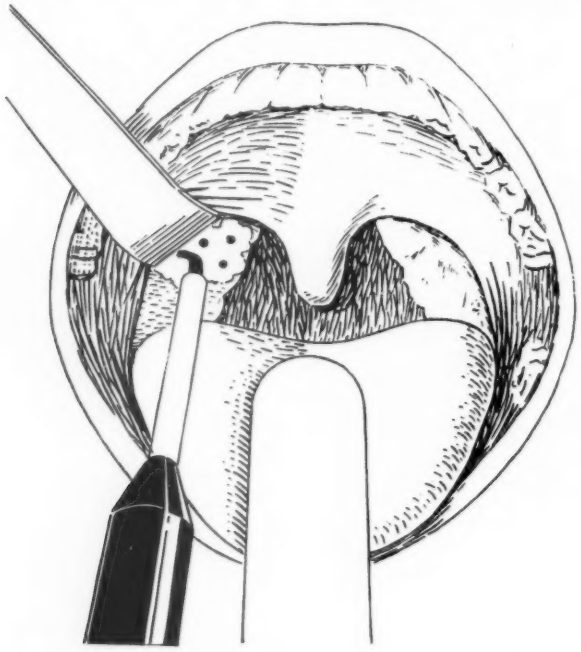

Fig. 4. Active electrode in situ; area of coagulation. Where the plica triangularis is markedly redundant the cutting current loop may be used for its removal. The convenience of the Biterminal Electrode is most manifest at the initial treatments of large vascular tonsils.

ments, requiring approximately six weeks.

Here, also, I may cite cases thought inoperable by surgical means, which responded readily to electrosurgery. Tuberculous infection of the tonsil with enlarged cervical lymph nodes, was operated upon in multi-stage fashion and a complete cure resulted. The nodes in the neck, one as large as a pigeon's egg, receded soon after the cutting current was used to incise the tonsillar abscess. Early carcinoma of the tonsil prior to metastasis, has responded successfully to destruction *in situ* by electrocoagulation. The finely divided particles of tumor tissue were expelled after destruction by frequent gargling. Deep x-ray therapy should always accompany and follow the electrosurgical radical tonsillectomy in these cases. I consider this method far more efficient and more readily controllable than the usual Radon Seed implants.

Zehr[10] has recently summarized his experiences with electrocryptectomy of the tonsil. I have corroborated his findings in scores of cases. In performing the electrosurgical extirpation of infected tonsils, we note, that frequently after the first two treatments, a patient will remark about the cessation of distal rheumatic pain. This relief takes place long before the tonsil has been totally extirpated. The explanation is of course evident: the infected crypts have been destroyed by coagulation; a common crater formed by the fundi of all the tonsillar crypts permits free drainage; *electrosterilization* of the tonsil has been performed. This phenomenon of relief of pain shortly after electrocryptectomy may eventually prove detrimental to some patients. Many patients come to us only for relief of symptoms. Once the aggravating symptoms of distal pain and discomfort are relieved, the patient quits in the midst of extirpation and waits for the return of symptoms. It is surprising to note how infrequently the remaining healthy tonsil becomes actively infected. My experience with over one thousand cases of electrothermic tonsillectomies over a period of eight years has favored the opinion that the conservative treatment of electrocryptectomy will often suffice and give as efficacious results as the more radical total extirpation which requires more time, effort and skill. I note this merely as scientific data, knowing full well what these seemingly heretical findings mean to the orthodox otolaryngologist. I always

TERMINATION OF TONSIL EXTIRPATION REQUIRES MOST DELICATE NEEDLE TECHNIC

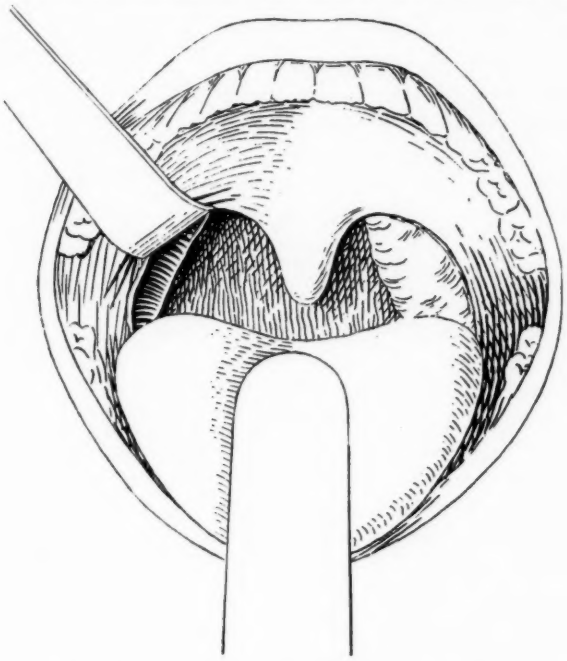

Fig. 5. From ten to twelve days later; cavitation. The finishing touches are best applied with the single, active, needle electrode. Ablation of tissue in apposition to the epithelial folds: anteriorly behind the palatoglossal muscle and inferiorly within the plica triangularis; posteriorly in front of the palatopharyngeal muscle and superiorly behind the plica semilunaris.

practice complete extirpation routinely when practical.

It is most important for us who welcome progress in any field to take cognizance of our findings as actually noted without color or bias. We must remember that the origin of many of our greatest discoveries in medicine followed what at the onset was viewed as quackery. The history of medicine is replete with the story of accidental discoveries. Occasionally we observe that even an old Shropshire "witch" may possess knowledge of an herb which later revolutionizes the treatment of heart disease.

A great discrepancy in reporting the results of electrosurgical tonsillectomy occurs when complete and incomplete extirpation are considered. We may have good clinical results long before total extirpation; hence, the most difficult part of the operation requiring the greatest skill and knowledge of the minute anatomy of the throat, is often left incomplete due to no fault of the operator.

Let us analyze from a newer angle the findings of Rhoads and Dick concerning the efficacy of tonsillectomy for the removal of focal infection. Their inference that seventy-three per cent of the nurses showed recurrence, and that the remaining tonsillar tissue carried more pathogenic bacteria per gram than the original tonsil, does not apply to our method of modified electrocoagulation. The accompanying diagrammatic sketch (Figure 6) clearly shows that the area of sterilization penetrates considerably beyond the extirpated or coagulated portions of the tonsil. Similarly, the work of Kaiser,[11] who made a controlled study of forty-four hundred school children in a period of ten years, and showed thereby the close relationship of certain infections to the presence or absence of tonsils and adenoids, applies only to the orthodox surgical operation. He found that some infections were not in the least influenced either favorably or unfavorably, by the presence or absence of lymphoid tissue. These observations and those made clinically by the writer on a group of patients under ten years of age showing the interrelationship of the tonsils to the endocrine chain of glands, all tend to show that the tonsils have a greater function than that of just being a "catch basin" for patho-

genic germs. Mass tonsillectomy as practiced wholesale in our school groups and institutions, following a hasty examination is to be deplored. The occasional death is a grim warning of the operative risk.

Maillard[12] has described a case of electrodesiccation of tonsils harboring the *monilia Krusei* (Castellani) and nonvirulent diphtheria bacilli. Cultural tests indicated that the organisms were eradicated during the course of treatment proving that toxic absorption was eliminated long before the total extirpation of the infected nodes. It is important to note here that the lack of a uniform and standard nomenclature prevents a truly scientific analysis of the findings of various investigators. Many use the term "desiccation" or monoterminal current applied to the depths of tissue interchangeably with coagulation or biterminal current. Desiccation requires much higher voltage and is much less effective when total destruction of tissue is desired. Therefore, the technic of desiccation as described by Schmidt[13], in a lecture on surgical diathermy at the Presbyterian Hospital and Medical Center, is much less efficient in the total extirpation of tonsils. The terminology of Wyeth, slightly modified, as it appears in his book on *Electrothermic Methods in Neoplastic Diseases,* seems to be best adapted to our work. I have long dropped the terms bipolar and monopolar because they are inaccurate and confusing in the field of Electrosurgery. Whether one uses the biterminal coagulation electrode first described by Bierman, or a separate dispersing electrode, makes but little difference.

It is of great importance, however, for scientifically controlled and duplicatable results to use, always, a constant dispersing or passive electrode in as close apposition to the active electrode as possible. The writer has found a multi-hinged metal collar fitted anteriorly over the neck of the patient to give the constant results desired. This arrangement permits the free use of a single needle electrode to actively coagulate the tonsil where delicate work is essential. The biterminal electrode now in more common use is a convenience for the initial work on large vascular nodes, but cannot replace the single, active, needle electrode for finer work. It is essential of course, to use the latter in the proper functioning of my modification of simple coagulation. Lest we be confused by the end-results of surgical tonsillectomy, permit me to define what is required of the ideal tonsillectomy.

(1) Removal of the infected lymphoid tissue only.

(2) Preservation of the innocuous normal structure, such as the palatoglossal and palatopharyngeal muscles; the epithelial folds which support the faucial lymph nodes, such as the plica semilunaris superiorly and the plica triangularis inferiorly.

(3) Complete absence of shock.

(4) Absolute control of hemorrhage.

(5) Freedom from undue discomfort.

(6) Insurance against incapacitation.

With this standard of perfection always in view we are obliged to reflect that a reconsideration of the surgical anatomy of the tonsil is necessary. Electrosurgery forces us to accurately remove only that which is deleterious and leave intact that which is normal and beneficial.

Modified Electrocoagulation Technic

The tonsils are prepared in the customary manner by spraying or swabbing the fauces and adjacent tissues with a two per cent solution of Butyn or two per cent Nupercaine.

McAuliffe, Jr., tonsil aspirator and crypt irrigator is attached to each tonsil and the detritus quickly and efficiently removed. The crypts flare open by suction and are simultaneously cleansed by the antiseptic irrigating solution. The tonsil to be treated is then tested for sensitivity. Ordinarily the spraying of the tonsil twice, with instructions to the patient to hold the solution with the head tilted toward the side to be treated for two minutes, suffices for total anasthesia. Complete and thorough coagulation for a depth of from two to four millimeters (depending upon the size of the tonsil to be treated) is first performed with the biterminal current. The indifferent electrode is then removed from the neck and the monoterminal current is used for the remainder of the operation. The active needle electrode is then carefully thrust into the tonsil just deep to the coagulated area and the Oudin current increased until maximum tolerance. The patient must sense gradually increasing heat which, after one-quarter of a minute's application, more or less (depending upon the concentration of the current), will sufficiently desiccate the vessels in the area just deep to the coagulum. When desiccation has been

DIAGRAMMATIC SKETCH OF THE HISTOLOGICAL EFFECTS OF HIGH FREQUENCY CURRENT

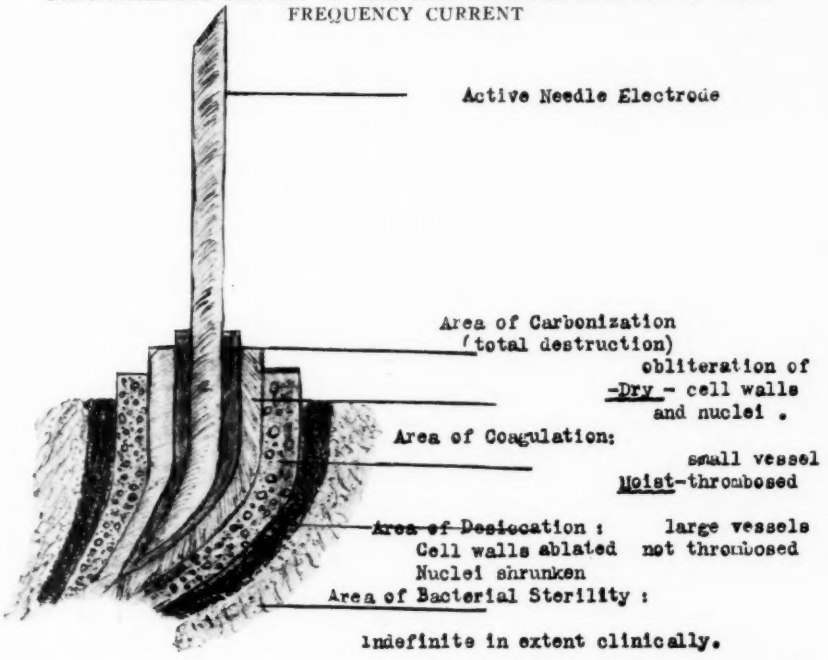

Fig. 6. Demonstrating the Rationale for my modification of the simple Coagulation Technic. If separation occurs in Moist Coagulation area bleeding is bound to result. Thrombosis of the large vessels in this area is accomplished by deep desiccation. When separation does occur approximately 12 days later, the freshly denuded surface is protected by secondary thrombosis of the large, otherwise unaffected and patent vessels.

performed by repeating the insertion of the monoterminal needle from three to five times, the surface of the tonsil is sprayed several times by a two millimeter spark. Fulguration thoroughly seals the lymphatics, prevents plastic adhesion, avoids a foul smelling slough, and hastens the separation of the coagulum.

By perfecting this technic, I have found that in the large vascular tonsils, where the temptation to remove a large mass of tonsil at one sitting is apt to assert itself, secondary hemorrhage can be scientifically controlled. As shown in the diagram the deep desiccation reaches those vessels which are too large for the marginal effect of the coagulating electrode. The secondary thrombosis which follows deep desiccation prepares the denuded surface for the separation of the coagulum ten to fourteen days later. Since the adoption of this technic, secondary hemorrhage, the *bete noir* of radical surgery, has no longer remained a factor with which we were wont to contend. The small vessels are readily plugged by the heat of the coagulating (biterminal) current. The larger vessels are sometimes partially thrombosed, or more often, the walls of these vessels are hyalinized while the rapidly flowing column of blood cools the intima of the vessel too rapidly to permit complete thrombosis. It is here that my modification of secondary desiccation deep to the area of coagulation plays an important role. (See accompanying diagram). The localized heat of the monoterminal or Oudin current is sufficient to complete the desired secondary thrombosis of the deeper and larger tonsillar branches.

Analysis of Modified Electrocoagulation Technic

I noted in my earlier work,[14] that there existed a danger from secondary hemorrhage if large masses of tonsil were coagulated with the intent of hastening the end-result. I also observed that bleeding would sometimes occur if the active, needle electrode penetrated into the larger, deeper vessels of the tonsil, in spite of perfect, snow-white, properly timed coagulation. These observations led me to study the effect of the various currents of the high frequency apparatus on the morphological anatomy of the tonsil. It was then that the modified technic was evolved.

Many experienced Otolaryngologists, skilled only in the orthodox surgical technic, have of late attempted to quickly extirpate tonsils by electrocoagulation. Many causes for failure are evident to those of us who are more thor-

CLINICAL ANALYSIS OF THE UNTOWARD REACTIONS
In One Thousand Electrosurgical Tonsillectomies

	SIMPLE COAGULATION		MODIFIED COAGULATION TECHNIC	
	Number of Treatments to Each Tonsil		Number of Treatments to Each Tonsil	
	2	4	4	5
Incapacitation	Two Days	One Day	None	None
Hemorrhage	Four Cases Controlled by Fulguration	One Case Controlled by Tr. Ferric Chlor.	One Case Blood Dyscrasia Controlled by Fulguration	None
Dysphagia	Six Days	Four Days	Three and One Half Days	Two Days
Edema Adjacent Tissues	All Cases	Less Than Half of Cases	Half of Cases	One Sixth of Cases
Complications (Miscellaneous)	Foul Breath Large Slough Rarely Clean Fossae	Foul Breath Smaller Coagulum Cleaner Fossae	Mild Foul Odor on Breath	Transient Foul Breath
End-Results	Electro-cryptectomy	Electro-sterilization	Fossae Ragged	Fossae Clean

The above chart demonstrates the necessity of prolonging the number of treatments in the multi-stage electrosurgical tonsillectomy. The absence of hemorrhage and the comparative comfort of my modification of simple coagulation technic are evident.

oughly experienced in this work. The question of secondary hemorrhage and its eradication has been thoroughly considered both by way of modified technic and controlled gradually multi-stage extirpation. Indeed, we are all the victims of habit. We do not fuss or fret about visiting the dentist for some score of sittings in order to have a prosthetic alteration performed on our teeth which at the best is only temporary. Dentistry has accustomed us to be patient and we expect prolonged delays in our oral embellishment. Similarly, may we, in the medical profession, educate our patients to the necessary and prudent procedure of visiting the physician during a period of three months, at weekly intervals, and thus, permit the completion of a safe tonsillectomy, free from shock and incapacitation.

Some have noted that the pillars have a tendency to close over the fossa following coagulation when more than one week is permitted between treatments. This may be avoided by closely following my modification of simple electrocoagulation. The superficial fulguration of the previously coagulated and desiccated tonsil ensures a dry, non-adhesive surface, preventing plastic adhesion of the opposing pillars. Rarely is it necessary to resort to the cutting current to free such adhesions.

I have found it advisable to see every patient six weeks, six months and one year after total extirpation. This follow-up insures against the possibility of overlooking any microscopic nodules which later form the lymphoid islands commonly seen after surgical tonsillectomy.

Research in any field is to sift the grain from chaff; to realize truth and falsehood known and named as such. Wahrer,[15] who has done considerable work in this field, is convinced that it is the method of choice in certain cases where radical surgery is contraindicated. At the last session of this congress, Balmer[16] most ably epitomized my views on electrosurgery of the tonsils. He noted particularly that no method of tonsil removal has yet been devised that is ideal under all circumstances. The combination of surgery and electrosurgery is a means of approaching this ideal. Waring[17] is agreed that it is the method *par excellence* for the removal of stumps and tabs of tonsil tissue and that properly handled, the tonsils may be safely and completely removed without bleeding or damage to the adjacent normal tissues.

A complete review of this subject would go far beyond the scope of this paper; but suffice it to say, that pioneers in this field, like McKenzie[18] and Warner Collins,[19] of England, Portmann, of the University of Bordeaux, Skillern[20] of Philadelphia, Dillinger,[21] of Pittsburgh, and of late, a host of others, have all agreed after prolonged and thorough investigation, that electrosurgery is definitely established in the field of Otolaryngology.

Summary and Conclusions

1. The concensus of authoritative opinion is that our end-results in the orthodox surgical operations in Rhinolaryngology are still far from perfect.

2. Electrosurgery offers the treatment *par excellence* for the removal of tabs, cicatrices and the resultant cicatricial contraction.

3. Electrosurgery as an adjunct to surgery is capable of producing perfect results in tonsillectomy.

4. Electrocoagulation of turbinates frequently avoids more radical nasal surgery with far better end-results. Nasal mucosa suffers a minimum of trauma by newer technic.

5. Diathermy in early sinus cases often averts more radical interference.

6. Electrosurgery being controllable permits a multi-stage operation to replace the more radical single stage operation. This makes operation possible by electrothermic methods wherever orthodox surgery is contraindicated.

7. A shock-proof, bloodless tonsillectomy is possible when the proper skill and knowledge of the recent advances in electrosurgery are mastered.

8. With a minimum of five treatments to each tonsil alternating weekly, we may perform a perfect tonsillectomy. Incapacitation or even loss of a single meal does not occur with the average patient.

9. The author's modification of simple coagulation has avoided secondary hemorrhage in the last six hundred and thirty cases.

10. An analysis of one thousand electrosurgical cases over a period of eight years, leads the writer to the conclusion that time must be sacrificed in electrosurgery for safety. Marked discomfort and possibly serious secondary hemorrhage may follow the single stage operation.

11. Patients should be seen six weeks, six months and finally one year after total extirpation of the tonsils.

12. Malignant and tuberculous tonsils which are otherwise inoperable, are peculiarly suited to the electrothermic technic.

13. Obstinate mycotic infections respond readily to electrosurgery.

14. Lingual tonsils, tubal tonsils and varices are easily removed by electrosurgery. Operation is bloodless and discomfort is slight.

15. Electrosurgical tonsillectomy is the operation of choice in the aged, physically debilitated, hemophiliac and the entire gamut of the organically diseased. Perfect end-results with minimum of shock, loss of blood and trauma account for the superiority of electrosurgery properly controlled, over orthodox surgery.

16. A more detailed knowledge of the anatomy of the nose and throat and a rigidly perfected technic are the *sine qua non* of success in this new field.

17. Much more time and effort is necessary to master electrosurgical technic than that of ordinary surgery.

18. With the recent advances in technic and the improvements in the insulation of cutting current knife and snare, we may hasten the end-results with less trauma to normal tissues.

1050 Park Avenue, New York City.

Bibliography

1. McAuliffe, George B.: The Perfect Tonsillectomy. *Med. Rev. of Rev.*, **35**:157 (March) 1929.

2. McFee, Wm. B.: Paper read before the *Amer. Soc. Physiotherapy*, Wash., D. C., 1926.

3. Rhoads, P. S., and Dick, J.: Efficacy of Tonsillectomy for the Removal of Focal Infection. *Jour. A. M. A.*, **91**:16, 1928.

4. Knox, Leila: Radiation Therapy of Tonsils. *Jour. A. M. A.*, **94**:705 (March 8), 1930.

5. Forbes, Henry H.: Discussion of the author's paper at a Symposium on Electrosurgical Tonsillectomy at the Academy of Medicine, N. Y. C., December 3, 1930.

5a. Silvers, Lewis J.: Electrothermic Extirpation of Tonsils, The End Results with a Newer Technic. *Arch. Physic. Therapy X-Ray, Rad.*, **12**:6 (June) 1931.

6. Brooke, Charles R.: Adjuvant Action of Diathermy in Nasal Accessory Sinus Disease. *Physic. Therapeut.*, (April) 1928.

7. Hollender, A. R., and Cottle, H. H.: Nasal Accessory Sinus Disease. *Ill. Med. Jour.*, (August) 1927.

8. Hurd, L. M.: Application of the High Frequency Currents in Otolaryngology. *N. Y. State Jour. Med.*, **31**:4, (February 15), 1931.

9. Silvers, Lewis J.: Electrosurgery in an Obstinate Case of Actinomycosis of the Tongue and Throat. *N. Y. Med. Jour.*, (September 15), 1931.

10. Zehr, N.: Electrocryptectomy of the Tonsil. *Phys. Ther. N. Y.*, **49**:80 (February) 1931.

11. Kaiser, A. D.: The Relation of Tonsils and Adenoids to Infections in Children. *Amer. Jour. Dis. Child.*, **41**:568 (March) 1931.

12. Maillard, Edgar R.: Electrodesiccation of Tonsils Harboring Monilia Krusei (Castellani) and nonvirulent Diphtheria Bacilli. *N. Y. State Jour. Med.*, **31**:895, 1931.

13. Schmidt, William: Electrothermic Treatment of Accessible Malignant Growths. *Arch. Physic.*

Therap., X-Ray and Rad., **13**:— (March) 1932.

14. Silvers, Lewis J.: Electrosurgical Extirpation of Tonsils. A Clinical Study of the Various Methods Employed with their End Results. *Arch. Otolaryng.*, **12**:511 (October) 1930.

15. Wahrer, F. L.: The Method of Choice in Tonsillectomy. *Arch. Phys. Ther. X-Ray Rad.*, (January) 1930.

16. Balmer, Frederick B.: Evaluation of Electrosurgery of Tonsils, *Arch. Phys. Ther. X-Ray Rad.*, **12**:13 (January) 1931.

17. Waring, J. B. H.: A Few Kind Words for Tonsillar Electrocoagulation. *Amer. Jour. Phys. Ther.*, (March) 1931.

18. McKenzie, Dan.: *Diathermy Medical and Surgical in Otolaryngology*, MacMillan Co., N. Y., 1930.

19. Collins, Warner: Tonsillectomy by Diathermy under Surface Anasthesia, *The Lancet*, (April 19) 1930.

20. Skillern, Jr., Samuel R.: The Last Word in Surgical Tonsillectomy including Diathermy or Electrocoagulation. *Virg. Med. Jour.*, **55**:10 (January) 1929.

21. Dillinger, G. A.: Electrocagulation of Tonsils. *Med. Jour. and Record*, **125**:659 (May 18) 1927.

Ultraviolet and Infrared Glasses

S. English, D.Sc., F.I.C., F. Inst.

(Summary of a paper read before the Illuminating Engineering Society)

Wherever we produce visible radiation we practically always, if not invariably, produce invisible rays at the same time, whether we want them or not, and we therefore need to know something about glasses for transmitting and for absorbing such rays, so that we can control and make use of such radiations.

Invisible infrared and ultraviolet rays are produced by exactly the same type of ether waves as produce visible light, and they obey the same physical laws; the only essential difference is in their wave-lengths. The visible spectrum is generally supposed to terminate at the violet end at about 390μ; the ultraviolet extends from this figure down to about 14μ, beyond which lies a band of x-rays. At the other end of the spectrum the red is generally regarded as becoming invisible at about 780μ, and from this figure upwards there lies the infrared zone; encroaching on the upper end of this zone are the Hertzian and wireless waves. Only a small range of wave-lengths is occupied by the light-producing rays. The ranges of rays produced by different artificial sources often extend into both the ultraviolet and the infrared, much beyond the sunlight limits. It may be taken almost as axiomatic that radiations which are found in the sun's spectrum are not harmful to ordinary animal or vegetable life, but that rays which are produced artificially and lie beyond that range may be harmful in some way if used indiscriminately.

The ultraviolet rays are characterized by their strong chemical and biological activity, and a certain small band of them is very important indeed in promoting good health, but only a very narrow band lying quite near to the limit of the sun's spectrum and extending only from about 295μ to 320μ. The band has become known as the health rays. The ideal material for transmitting these rays is clear silica, but it is too expensive for general use. Although ordinary glass generally consists of 70 to 75 per cent silica, its ultraviolet transmission is not comparable with that of pure silica. The two constituents which are most favorable to ultraviolet transmission are silica and boric oxide; the two most dangerous constituents are iron oxide and titania. We, thus, once more come across the illuminating-glass manufacturers' old enemy—iron oxide, with its tantalizing habit of changing over from the ferrous to the ferric state, and *vice versa*, under certain sets of conditions. In all ultraviolet glasses the iron oxide content should be below 0.02 per cent; as it increases from 0.005 to 1.01 per cent the limit of ultraviolet transparency changes from about 250μ to 325μ. When iron is present in a glass in the reduced, or ferrous condition, it is much less dangerous than when present in the ferric condition, the manufacture of which is in some cases still regarded as a secret; but at present all ultraviolet transparent glasses are melted under reducing conditions, and reducing agents are usually included in the batch mixture.

Working along these lines, several very promising glasses have been produced of fairly satisfactory transparencies to the invisible health rays, to which ordinary glasses are opaque, but all ultraviolet glasses are not equally efficient in transmitting the zone that is most important, namely, that from 25μ to 320μ. The best commercial glasses at 310μ

have a transmission of about 73 per cent; more transparent glasses have been prepared, but they are not satisfactory in other respects. The difference is no doubt due to composition, for boric oxide tends to produce a high transmission with a sharp cut-off, and lime tends to give a flatter curve. The advantage in favor of boric oxide needs using very carefully, for, if it is pressed too far, numerous manufacturing difficulties arise that render the glass bad in every respect but ultraviolet transparency.

Again, when these glasses are exposed to ultraviolet radiation, either from the sun or from an artificial source, the iron oxide (though very small in amount) which has been brought to the ferrous, or reduced, condition by the special manufacturing processes is transformed to the ferric, or more highly oxidized, condition. Because of this change, a glass which has a transmission of, say, 60 per cent of the health rays when new, may have this figure reduced to 50 per cent, or perhaps even 40 per cent, after its iron oxide has reached the equilibrium condition. Of course, when once this equilibrium has been reached for any particular set of conditions, no further change takes place unless the conditions of exposure of the glass are altered. In the case of exposure to sunlight, this "solarization" often takes from three to six months to reach completion. All commercial glasses suffer from this defect in varying degrees.

Arc lamps with metal or impregnated-carbon electrodes and mercury-vapor lamps in silica tubes have been used very successfully for curative purposes by medical men, but they need to be used very carefully, for it is possible to concentrate on to a person under treatment much more ultraviolet light than he would get by exposure to the sun, and also rays of much shorter wave-length, which are certainly injurious to the eyes and also generally if the dose is not carefully controlled.

The ordinary electric lamp does not emit any appreciable quantity of the ultraviolet rays in the 295μ to 320μ zone, but lamp manufacturers, in their desire to provide an artificial light with sunlight qualities, have developed several types which are claimed to be perfectly safe to use in a general way without medical control. Each makes use of ultraviolet transmitting glass, and one of them is very similar to the ordinary gas-filled lamp. It has a tungsten filament, which is overrun to such an extent that the utraviolet emission is materially increased, though the average life of the lamp is reduced to 300 hours. The bulb consists of an ultraviolet transparent glass of bluish color and acid finished inside. Another type is a combination of a tungsten filament and a mercury-vapor arc between tungsten electrodes enclosed within an ultraviolet glass bulb. A drop of mercury, which is enclosed within the bulb, gives off sufficient vapor to start an arc between the tungsten electrodes almost immediately after the current has been switched on. By combining the filament light with that of the arc the unpleasant color of the mercury-arc light is somewhat reduced. It is a low-voltage lamp (35 V starting, 11 V running) and requires a rather heavy current (30 amperes). A third type is a low-pressure mercury arc enclosed within an opaque silica (vitreosil) tube and shielded by an ultraviolet glass screen; a special starter is required.

Wood's glass, which is opaque to the visible rays, but transmits the invisible ultraviolet rays, owes its peculiar properties to the fact that it contains a proportion of nickel oxide on a potash base, sufficient to color the glass very deep blue and thus obstruct the passage of visible light. The best way of showing the presence of ultraviolet rays is by using substances that convert very short wave-length rays so as to extend them into the range of visible rays. One such means is a fluorescein solution in a silica vessel, but "canary" glass, greenish-yellow color and containing as small a proportion as 1 per cent of uranium oxide on a soda-lime base is strongly fluorescent. Wood's glass has proved to be very valuable in research, for quite a number of things can be picked out under the influence of ultraviolet rays in the absence of visible light, *e. g.*, hair from a scalp infected with ringworm shows strong fluorescence, while hair free from infection does not; genuine pearls and many valuable stones may be distinguished from imitations; and even the end point of an acid-alkali titration can be determined by using the fluorescence of quinine as an indicator.

Another type of glass transmits the visible rays without appreciable selective absorption, but has varying degrees of ultraviolet absorption. Developed on the basis of the pioneer work of Sir William Crookes, the oxide of

cerium (ceria) is still an essential constituent of all such glasses as are nearly colorless. Besides being used for spectacles, glasses of this character may prevent the fading of colors which are sensitive to ultraviolet light. If a colored glass is not objected to, then an amber glass colored by iron and manganese oxides is very efficient in absorbing ultraviolet rays right up to the end of the visible spectrum, *i. e.*, up to 390μ to 400μ.

On turning to the invisible infrared (heat) rays extending from 780μ upwards, we again have three types of glasses: (1) for transmitting both visible and infrared rays, (2) for absorbing infrared but transmitting the visible rays, and (3) for transmitting the infrared and absorbing the visible rays. Pure fused quartz of a thickness of only 1 mm. is opaque to heat radiations at about 5μ, so that if better transparency is desired (as in the manufacture of certain scientific instruments) recourse must be had to rock salt, which transmits up to or beyond 16μ. Both soda and lime reduce heat transmission to a certain extent, but are not very effective in this respect. Practically colorless sheet glass 2.5 mm. thick, giving a light transmission of 90 per cent, gave a heat transmission of 88 per cent when the clear sun was used as source and 80 per cent when a 500-watt lamp was used. All the heat-absorbing glasses available today rely for their special properties on the presence of iron in the lower state of oxidation. The only difference between them is the method used for manufacture to reduce the iron oxide to this ferrous condition, for it must be remembered that when a glass containing iron oxide is melted without any attempt to control the state of oxidation, then the two oxides (ferric and ferrous) are both present in a state of equilibrium. The best way to introduce the iron and the necessary reducing agent is to add them in the form of iron tartrate, which decomposes under the action of the heat of the furnace, and the iron oxide and its reducing agent are then formed separately, but in intimate contact; more recently non-organic reducing agents have been used with success. In general the strong heat absorption is accompanied by poor light transmission, but the two factors are not accurately proportional to one another. By the use of such glass it is possible during hot sunshine out-of-doors to keep the temperature indoors quite cool. Of course, the blue-green color of the glass is not in its favor, but in artificial illumination this type of glass finds a useful field, especially in those cases in which a high concentration of light is required without the ordinarily attendant heat, *e. g.*, in certain types of hospital operating units.

A very interesting glass has the power of absorbing all visible rays, but transmitting infrared rays. Such a glass appears black in thicknesses of 2 mm. and upwards, but in very thin sections it has a reddish amber color. As a means of invisible signalling it has almost superseded Wood's glass, since infrared rays are easier to produce in quantity than ultraviolet rays, and they also have the great advantage of carrying further, as they are not easily absorbed by the atmosphere. For burglar alarms and apparatus of that type this glass has an interesting field of usefulness.—(*The Electrical Review.*)

ARCHIVES of PHYSICAL THERAPY, X-RAY, RADIUM

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E D I T O R I A L S

PHYSICAL THERAPY IN ANTERIOR POLIOMYELITIS

While it is safe to state that the final word in the treatment of many known diseases has as yet not been written, modern therapeutics has, nevertheless, been consistent in the domination of its progress. This sentiment is as much apropos in regard to the present concept of the management of anterior poliomyelitis as it is to many other well recognized affections. The protean qualities of poliomyelitis have been so fearfully impressed upon us that it only needs to lift its head as it were above the whisper stage of action and all the frustrations connected with our previous experiences rise up in all their naked failures to accuse us of our inadequacies.

The literature is still littered with confusing opinions and heterogenous suggestions which tend to becloud rather than clarify the management of this malady. From the point of view of speedier recognition we have gained ground; from the point of view of prevention by means of sequestration we have made progress; from the point of view of specific treatment, opinion is still in abeyance, due to the fact that neither pharmaceuticals, synthetics or serums have as yet been able to consistently swing the day in favor of its results.

Its epidemic visitation of last summer has again emphasized our therapeutic limitations, particularly in the presence of febrile symptoms. According to Wynne[1] who was in charge of the epidemic in New York, during the 1931 period, the speedy recognition of the presence of poliomyelitis was accomplished by an intelligent educational campaign which included provision for specific laboratory diagnosis, sharp sequestration of patients, and recognized measures for treatment. The entire offensive was notably successful within the limits of the present preventive methods at our command. However, in spite of the intelligent cooperation that was inducted into this campaign, nothing substantial in the form of any specific therapeutic check has thus far

come out of our recent experiences. Indeed, Wynne remarks, "The value of serum, convalescent or horse, has, up to the present time, not been definitely determined." It is to be hoped that these determinations in the presence of meticulous controls, will elicit information of substantial value for the prevention of the depressing sequellae that has resulted from this epidemic. For, as he states, "We now face a problem of equal importance and one that will be of long duration, the problem of aftercare."

Out of these experiences there has arisen an inharmonious and clashing note which has colored the situation in many despondent overtones as regards our ability to cope with the initial situation successfully. It has at the same time forced the attention of the profession to look for measures other than medicinal to check the progress and the crippling effect of its sequellae. Physical therapy has here been recognized as the method *par excellence* in rehabilitating these patients toward a more normal, functional state. This state of affairs is clearly illustrated by the conservative tone adopted by Galland,[2] an orthopedic surgeon of recognition and a student of the subject, and reflects a lack of collateral faith in orthodox procedure. He remarks that, "It is difficult to attempt to elucidate before a body of physicians any hopefully useful outline for their guidance in treating the patients crippled by the scourge of poliomyelitis." He infers even that in a symposium on the subject one is perforce ready to admit that one departs by the "same door wherein you entered," — that is to say, little can be gained from the listening to such discourses. That the foregoing remarks were in a manner premature was happily contradicted by the discussion of his paper and by the essayist himself, a fact no doubt observed by the readers of the symposium which is published elsewhere in this issue.

Therapeutic experimentation has often resorted to the trial and error method, and has by experience pressed its advantages wherever it has observed the benefits from such procedure. In connection with poliomyelitis we now realize that inversely to the little that has been contributed by medicinals towards the relief of its febrile stage, a great deal has been accomplished by the intelligent application of various physical methods in the later and even the earlier stages of this disease. According to Ruhräh,[3] during the febrile period all efforts at treatment should aim to make the patient as comfortable as possible, using the technic which would be applied to any acute infection. Rest is essential and the late results are best when that is insisted on, whether the case is mild or severe. The patient should be kept in bed as long as there is pain, but during this period it may be advisable to lift him to another bed or comfortable chair while the bed is aired or made. When, however, the internist enters the competitive field of orthopedic management he becomes lost in a maze of generalities. This is aptly illustrated in the differences of opinion when, for example, Ruhräh advocates the immobilization of parts because of pain and contractures by light plaster casts which must be cut so as to enable bathing, massage, manipulation and rest, and Galland's contradictory detailed exposition for the control of hyperesthesias and contractions by methods other than plaster or splints. At once it is apparent that the management of poliomyelitis requires a specialist thoroughly conversant with orthopedic procedure, internal medication, plus the additional experience connected with a thorough comprehension of the value, technic and the application of properly balanced physical therapy measures, or that happy combination where each ideally supports the efforts of the other.

Since rehabilitation of muscle function is probably the most important objective following the proper immobilization of the part, intelligent physical therapy has here its greatest opportunity to demonstrate its usefulness in the restoration of the physiologic function of the part affected. According to orthopedic authorities this should begin when all acute manifestations have subsided. Modern physical therapy not only offers specific therapeutic advantages during the post-febrile period of convalescence, in the form of regulated exercises, electro- and hydro-gymnastics, massage and the education of voluntary effort, but it offers additional possibilities in the form of heat, light and x-ray treatment preceding the post-febrile state. Pomeranz[4] remarks that "x-ray treatment of anterior poliomyelitis where hyperesthesia and muscle spasm are dominant symptoms appears to be justified by experience gained during the last two epidemics." His results have been so gratifying that he has frequently employed this method,

particularly where hyperesthesia and muscle spasm were prominent symptoms. Bordier,[5] the originator of the method, has since then advocated diathermy as an important adjuvant in the treatment of this disease. Wolf's[6] experiences with diathermy in anterior poliomyelitis has prompted him to remark that "diathermy has a special field in the treatment of anterior poliomyelitis. It should be applied as soon as the signs of inflammatory reaction have subsided." Snow,[7] however, advocates the introduction of physical measures such as heat, radiant light and static electricity before the febrile state has subsided, and bases her contention for this on the fact that experience has demonstrated favorable effects by such procedure. She states, "Special physical measures may be used at the onset of the disease. A favorable prognosis varies in degree proportional to the time of the institution of physical measures in the treatment . . . . In anterior poliomyelitis, infection with resultant inflammation and its sequellae are present . . . . Radiant light and heat induces hyperemia, phagocytosis, nutrition and metabolism . . . . The static current has marked mechano-contractile effect. It relieves stasis, muscle tension, muscle spasm, and promotes drainage."

That precision and experience are definite requisites in the successful management of this type of treatment is now a well recognized fact. In spite of many warnings in this direction the tendency of the general profession is still to group the entire régime of physical therapy under the single management of a possible lay masseur and depend upon his vigorous ministration to carry the patient through that critical period of his disease. The futility and ignorance of such optimism on the part of the profession has resulted in the many incurable situations scattered all over the land, and this in spite of constant warnings to the contrary. It should be remembered, for example, that massage can only improve local muscle tone and prevent atrophy in non-paralyzed muscles. In the presence of paralysis, massage should only be introduced with the greatest delicacy. Electrogymnastics, or electric stimulation, in order to be effective, must, according to Kovács'[8] warnings, "be carefully planned and skillfully applied for a sufficiently long period . . . Treatment does not consist of simply slapping on two wet-pad electrodes somewhere along an extremity and turning on some form of current as powerful as possible. Badly-directed and badly-applied treatments of the past were mainly responsible for the indifferent if not the decidedly antagonistic, attitude of some medical men toward electrotherapy in infantile paralysis."

If any particular lesson may be deduced from the treatment of anterior poliomyelitis it is this: In proportion as our hopes have been delayed in awaiting for that expected panacea which would check the progress of this disease, so have our hopes been justifiably gratified because of the increasing successes met with in the treatment of the convalescent state by the proper and intelligent combination of rational orthopedic measures and physical therapy procedures. It would not even be stretching optimism to the breaking point to predict that physical therapy in the near future will not only become the recognized method of treatment during the period of rehabilitation, but it will soon have its advocates for its application in the febrile state.

References

1. Wynne, S. W.: General Problems of Poliomyelitis. *Arch. Phys. Ther., X-Ray, Rad.*, **13:**140, (March) 1932.
2. Galland, W. I.: The Post-Paralytic Treatment of Poliomyelitis From the Orthopedic Standpoint. *Arch. Phys. Ther., X-Ray, Rad.*, **13:**133, (March) 1932.
3. Ruhräh, J.: The Treatment of Poliomyelitis. *Jour. A. M. A.*, **97:**1224, (Oct. 24) 1931.
4. Pomeranz, M. M.: Discussion on Poliomyelitis. *Arch. Phys. Ther., X-Ray, Rad.*, **13:**141, (March) 1932.
5. Bordier, H.: *Diathermy et Diathermotherapy.* Paris: J. B. Balliere et Fils, 1927.
6. Wolf, H. F.: Discussion on Poliomyelitis. *Arch. Phys. Ther., X-Ray, Rad.*, **13:**145, (March) 1932.
7. Snow, Mary L. H.: Discussion on Poliomyelitis. *Arch. Phys. Ther., X-Ray, Rad.*, **13:**142, (March) 1932.
8. Kovács, Richard: Physical Therapy in the After-Care of Poliomyelitis Patients. *Clin. Med. & Surg.*, **39:**197, (March) 1932.

ELECTROSURGERY IN RELATION TO THE TONSIL PROBLEM

The increasing interest during the past few years in the tonsil problem is due in no small measure to the advance which electrosurgery has made in rhinolaryngology. Prominent specialists have interested themselves in this newer procedure, and some have gone so far as to conduct intensive and thorough clinical studies particularly with reference to the faucial tonsils.

The subject of tonsillectomy ultimately resolves itself into the choice of a method. Surgery will continue to be the routine means of removing the lymphoid structures of the fauces, in spite of the acclaim of faddists that electrocoagulation is the ideal procedure. Under certain conditions, however, its superiority to surgery has been rather definitely demonstrated. Hollender[1] recently reported on the electrosurgical extirpation of the faucial tonsils in the tuberculous and showed by careful clinical experimentation that the hazards of surgical removal in such patients can be eliminated.

The plight of the cardiac patient, the arteriosclerotic, and the aged individual who requires tonsillectomy is also decidedly lessened when electrocoagulation is suggested instead of surgical enucleation. Numerous writers have recorded their experiences with electrosurgery in these types of cases, and agree that shock is never a factor. Patients require no hospitalization, a fact which many times has relieved unwarranted fears.

Some have argued against electrocoagulation because they claim that all the tissue in the tonsillar fossa is not removed. This argument is unsound. All the lymphoid tissue can be removed, but, as Silvers[2] states, "it requires care, patience and perseverance." If a small amount of lymphoid tissue remains, there is no law against its destruction, and all that is necessary is further treatment until the operation has been thoroughly completed.

Probably one of the most important factors which has led many laryngologists to investigate the merits of electrosurgical tonsillectomy is the demand which patients have made for it. Some individuals flatly refuse surgical tonsillectomy and will not submit to it regardless of the seriousness of the indication. Are these individuals to be denied the benefits of an adequate substitute method?

The mistaken notion that electrocoagulation is a method which can be quickly acquired by any practitioner is unfortunate. The method is not difficult, but a certain fundamental knowledge of the anatomy of the pharynx is essential. As Silvers writes: "The difficulty facing the beginner in this work is that of removing only the tonsillar tissue and leaving the normal epithelialized structures intact. It is in this regard that trained skill and a thorough knowledge of the minute anatomy of the nose and throat are essential".

Silvers writes further: "In performing the orthodox surgical tonsillectomy it matters but little what epithelial structures are removed as long as the pillars and uvula are left *in situ*. In the electrosurgical extirpation of tonsils, however, it matters greatly whether the normal tonsillar folds are coagulated and damaged. Many of the traumatic deformities noted after improper extirpation can be obviated by observing the anomalies in the anatomy of the tonsil".

So far as the technic is concerned, this phase is now in a state of confusion. The manufacture of numerous special electrodes and the advocacy of several specialized modifications of methods have complicated what basically is a simple plan of therapy. Experience has firmly demonstrated that *electrocoagulation* is preferable to other means of extirpation. There is no need to alter or to add to it such steps as *desiccation* and *fulguration*. These do not materially augment the end result, and while probably satisfactory adjuvants in highly trained hands, they add to the labors of the novice and the less experienced. It would seem, then, that a simplification of technic is desirable. This is attained by electrocoagulation in itself because it is possible with this procedure to completely extirpate the lymphoid tissue in the tonsillar fossa.

Secondary hemorrhage occasionally occurs irrespective of the technic employed. It is, therefore, erroneous to call electrocoagulation a bloodless method. True, primary bleeding is avoided, but the dangers of secondary hemorrhage are often far greater. It would be more accurately said that electrocoagulation is *nearly always* a bloodless procedure. The chief cause of secondary bleeding is the overeager effort to coagulate a large amount of tissue at a single sitting and the premature spontaneous release of the slough. If this one fact is kept in mind, secondary bleeding can be reduced to a minimum.

When all the facts are carefully considered, electrosurgical extirpation must be said to be a safe and practical method. Balmer[3] concludes one of his papers on the subject by stating: "Electrocoagulation is a safe, tedious, time consuming, ultraconservative procedure requiring judgment, technical skill, patience and meticulous care".

There is no question that a prominent disadvantage is the number of treatments neces-

sary to complete the operation. The method *is* time consuming. While not always a factor, it frequently is of sufficient weight to be called to our attention. Patients commence the treatments and carry them about half way through only to become discouraged because of the length of time necessary for attaining a satisfactory end result. Incomplete tonsillectomy by diathermy can well be compared to a tonsillotomy by surgery and with similar consequences. The potential dangers of tonsillar remnants are well appreciated by the laryngologist and the internist.

The impetus which electrosurgery has received during the past decade is just beginning to show its results. In the management of accessible malignant new growths, in urology, in gynecology, and in other specialties, surgical diathermy is singled out as a distinct modern advance in therapy. It has changed the views of many on the tonsil question. Seemingly, the method is here to stay. Standardization of technic and rationalization of indications will ultimately advance the subject to the point where every specialist will have to show it consideration before he arbitrarily prescribes "surgical removal".

References

1. Hollender, A. R.: Electrosurgical Extirpation of the Tonsils in the tuberculous. Preliminary Report. *Illinois Medical Journal,* **61**:131 (February), 1932.

2. Silvers, Lewis J.: Electrosurgery in Rhinolaryngology. A Solution for the Tonsil, Turbinate and Sinus Problems. *Arch. Phys. Therapy, X-Ray, Radium,* **13**:154, (March), 1932.

3. Balmer, Frederick B.: Refinements in Surgery of the Tonsil Including Electrosurgery. *Illinois Medical Journal,* **60**:458, (December), 1931.

A TOUR OF SPECIAL INTEREST

Most well-read Americans know that the Nudist movement in Europe is no merely momentary fad. Hundreds of thousands of adherents are already devoted to this sun-and-air highway to physical, mental and moral health. Though its beginnings were slow and difficult before the war, it has grown with rapid strides in recent years; the number of its converts is said to have doubled during the last year. As no one who ever knows the exhiliration of getting free of our quaint ascetic inhibitions ever goes back to them (any more than we in America could now go back to the bathing suits of the gay nineties) the movement is steadily spreading and seems destined to sweep Europe and eventually — probably years later — America too.

A recent book by Frances and Mason Merrill, "Among the Nudists", has brought the subject widely to the attention of Americans. Within six months after its publication over six hundred readers of the Merrill's book had written him asking for directions as to how to reach these camps and for letters of introduction to their leaders. These letters came from lawyers, doctors, business men and women, teachers, and many others interested in the experiment now in progress on so large a scale in Europe — especially in Germany.

ORVILLE M. MOORE

(1859 - 1932)

History has often recorded the silent sacrifices and the extraordinary labors associated with the life of those medical practitioners who have dedicated themselves to the service of their fellowmen in the outposts of our growing country. The medical profession has learned to regard these toilers with deep respect and admiration because of their self-sacrificing labors — labors which have frequently risen to heroic proportions on the slightest demand upon them. These workers possess that sturdy resiliency and moral fiber

found only in that select group which can on occasions nonchalantly rise to superb heights under adverse circumstances. Among them have been found individuals who have challenged the wilderness to conform to man-made laws or those who have generously ministered to the needs of others without thought of consequence to themselves. According to the deeds associated with their efforts they are often classified as "nature's noblemen," "the pioneer," "the country practitioner." Indeed, these attributes are merely the distinguishing facets inherent in the characters of each and reflect the particular labors of these personalities at different moments of their lives.

Such a man was Orville Moore, a country practitioner who voluntarily sacrificed the perhaps broader opportunities of a larger community to labor in the less spectacular environments of a small town practice; a man who devoted over fifty years of his professional career to the ministration of the sick and the unfortunate in his urban location; a person whose civic and professional influence grew with years and who became respected, honored and beloved by all who came within his sphere of influence.

Moore reflected the progressive nature of many of his colleagues in similar environments by his thorough orientation with the latest thoughts and practices in medicine and in science. At the sacrifice of time and money he would frequently visit higher centers of education to inform himself in the newer progress in his field. As a member of the American Congress of Physical Therapy, he was an active participator in its scientific sessions. His orientation in electrosurgery was abreast of the latest thoughts on the subject, as indicated by his scientific papers and open discussions. His intellect was virile and benign, his experience active and practical.

In spite of the adjudication of outstanding authorities that his house must be placed in order because of the rapid advancement of malignant metastasis, he faced the future with as spartan-like an attitude as ever was described in classical literature. He received the verdict of his incurable state with fortitude, smiling calm, and detachment of scientific curiosity. His visit to Chicago but reconfirmed the earlier findings of the other men. In anticipation of an exploratory operation (which never took place) he was heard to remark, "I had hoped," he confided, "to have been of some use for ten or fifteen more years. But if this is to be the end, I have been here a good while, life has been full and I have no complaint." He died on the 19th of February.

The American Congress of Physical Therapy extends deepest condolence to his family.

WASHINGTON AWARD FOR MERITORIOUS RESEARCH

WILLIAM DAVID COOLIDGE

Recipient of the 1932, Washington Award for Meritorious Research in Advancing Human Progress.

In the light of the many achievements justly attributed to the genius of Coolidge, his most recent honor, the Washington Award, recalls certain thoughts expressed by Emerson in his essay on "Self-Reliance" which cannily points out the dominant virtue that has inspired men of his quality to the various accomplishments for which they have been honored. All such men are, in a sense, non-conformists to the accepted tradition of their intellectual environment. They are original because they are unconventional. They have learned to detect and watch "that gleam of light which flashes across his mind from within, more than the lustre of the firmament of bards and sages." Such men are prone to disregard books and tradition and speak their own and not other men's thoughts. And because the great majority of individuals have been submissive to the social order of our environment, we have learned to distrust the timid promptings of our inner thoughts and dismiss them without notice. "In every work of genius," says Emerson, "we recognize our regretted

thoughts, they come back to us with a certain alienated majesty. Great works of art have no more affecting lesson than this. They teach us to abide by our spontaneous impressions with good-humored inflexibility then most when the whole cry of voices is on the other side. Else tomorrow a stranger will say with masterly good sense precisely what we have thought and felt all the time, and we shall be forced to take with shame our own opinion from another."

The 1932 Washington Award was presented to Coolidge because of his valued contributions to science and "in recognition of devoted, unselfish and preeminent service in advancing human progress and particularly for the achievement in developing ductile tungsten and modern x-ray tube." This award was founded by John Watson Alvord and is administered by the Western Society of Engineers although more broadly the Commission represents the combined societies of American Society of Civil Engineers, American Society of Mechanical Engineers, American Society of Electrical Engineers, and the American Society of Mining and Metallurgical Engineers.

Dr. Coolidge was born on October 18, 1873, and was graduated from the Massachusetts Institute of Technology in 1896. After graduation, he served as an instructor in his own school. In 1899 he went to the University of Leipzig, and from there returned to Massachusetts Institute, and became an instructor in physics. In 1905, he became associated with the General Electric Company, and in 1908 was made assistant director of their research laboratories. There is nothing of the inventor in his make-up. He is deliberate, thoughtful, modest and taciturn, and knows exactly what he desires to achieve. His attainments have been many. There are two to which the Commission gave recognition in this award, the development of raw tungsten and the cathode ray. It was thought impossible to make tungsten ductile. What he evolved was ductile tungsten of full tensile strength, that could be curved, bent and twisted. It resulted in needles for phonographs, targets for x-ray tubes. The development of the cathode ray tube is still too immature to appreciate its full value. It may replace radium for treatment of cancer in hospitals.

Some of the most important contributions which Coolidge has made since his connection with the General Electric Company are the following:

Ductiletungsten, which found its first application as a filament material for the incandescent lamp.

The wrought tungsten target in the x-ray tube.

Wrought tungsten electrical contact-points for make and break devices, used, for example, in automobile ignition systems.

The hot-cathode type of x-ray tube, which bears his name.

Various types of x-ray generating equipment.

The so-called "C-Tube" a listening device used for submarine detection and for underwater signalling.

Modifications of the original Lenard cathode-ray tube which have greatly increased its power.

Dr. Coolidge is a member of the following societies:

National Academy of Sciences.
American Academy of Arts and Sciences.
Washington Academy of Sciences.
American Association for the Advancement of Science.
American Chemical Society.
American Electrochemical Society.
American Institute of Electrical Engineers.
American Physical Society.

and an honorary member of the following:

American Roentgen Ray Society.
American Radium Society.
The Radiological Society of North America.
American College of Radiology.
The Roentgen Society (of England).
Societe de Radiologie Medicale (de France).
Nordisk Forening for Medicinisk Radiologi (Scandinavia).

In 1914 Dr. Coolidge received the Rumford Medal for his invention of ductile tungsten, and has subsequently been awarded the Howard N. Potts medal, the Lewis Edward Levy gold medal, the Gold Medal of the American College of Radiology, the Hughes medal from the London Royal Society, the Edison Medal, and recently the Washington Award for 1932. He holds the honorary degree of Doctor of Science from Union College and from Lehigh University.

QUESTIONS AND ANSWERS

Q. Is roentgen therapy still used as a treatment for thyroid disease?

A. Roentgen therapy has been more widely used in the past than it is at present for toxic goitre. There is every reason to assume that certain cases will respond favorably to x-ray. In general, however, the tendency has been away from nonsurgical measures except in special instances. Numerous writers could be quoted on this subject, but a recent report by Remer and Belden (*Radiology* **14**:145) is in point. These workers urge that certain patients with toxic goitre should be given the benefit of irradiation for at least four treatments. Satisfactory improvement should be observed after four treatments, otherwise irradiation should be discontinued and the condition regarded as surgical. The authors assert that irradiation does not increase the difficulty of subsequent operation, but irradiation before operation renders a patient a better surgical risk. The danger of hypothyroidism, these same authors state, is negligible. Every patient should be governed by the basal metabolism test. Rest before irradiation is sometimes essential.

Another interesting report by Powell (*Radiol. Review,* **52**:21) discusses this subject from a somewhat different viewpoint. Powell believes that neither irradiation or surgery is 100 per cent effective. He explains the process that follows irradiation.

Q. What is "conization" and what are its advantages over other methods of treatment for chronic endocervicitis?

A. In an article by Hyams, (*Arch. Phys. Therapy,* **11**:171) the use of the high frequency current as conization of the cervix is fully detailed. According to Hyams, conization is sound in principle and is based firmly on a foundation of demonstrated facts in the anatomy, histology, and pathology of the cervix. The method has for its object the eradication and destruction of the diseased endocervical mucous membrane with its contained glandular structures, and this is accomplished with the preservation of the underlying muscle as well as the uninvolved tissues. The instrument used for conization is a metal tube about ten inches long and one-eighth inch in diameter with a silicon tube one and one-half inches long, attached to its distal end. Insulation of the metal tube in part and special applicators facilitate the use of the instrument. It is operated from a high frequency machine incorporating a special unit generating an electrical current of high wave frequency supplying unusual power to the cutting wire. This apparatus may be either of the gap or radio tube variety.

Numerous advantages are claimed for the method, chief among which are the following: (1) The method is used for the treatment of ambulatory patients. (2) There is no pain or discomfort. (3) There is little danger of subsequent bleeding. (4) The cervix remains functionally normal. (5) Repetition of the method is harmless and can be continued until the object is accomplished. (6) A minimum of scar tissue results.

Hyams specifically states: "Conization is offered as an additional link in the chain of progressive methods devised and in use to relieve the symptoms of chronic endocervicitis with the least discomfort to the patient."

Q. What deleterious effects of the ultraviolet rays on the eye have been observed? Is any treatment of value?

A. Lear (*N. Y. St. J. Med.,* **29**:1270) discusses this problem at some length emphasizing that ultraviolet rays are capable of producing a definite pathologic condition of the eye called "photophthalmia." There is a definite period of latency between the time of exposure and the onset of symptoms which are first itching, then pain and photophobia. The parts of the eye involved are the conjunctiva, cornea, iris and lens. The treatment consists in the administration of a cycloplegic and the application of cold. Smoked glasses during the acute stage are helpful. The symptoms do not last long and usually decline after 48 hours.

Q. Is electrocoagulation of value in the treatment of carbuncles? What is the technic?

A. Several articles have appeared on the subject. Surgical diathermy as electrocoagulation can be used to destroy a carbuncle under local anesthesia. Morgan (*Electrothermic Methods in Neoplastic Diseases*) gives his technic as follows: "The length of the needle used as the active electrode will depend on the size of the growth to be treated. Push the needle into the infected tissue as deep as is necessary to reach the deepest points of infection and allow it to remain there for 20 to 30 seconds, increasing the current if need be until the tissue is blanched white. Then stop the current, remove the needle and insert it into an adjoining area, again applying the current. Continuing in this way the whole diseased area can rapidly be destroyed. Most of the coagulated tissue should be removed at once with a curette and a dressing applied."

Q. How would you use infrared for the treatment of acute upper respiratory infections? What special advantage has its use in sinus disease in children?

A. Infrared radiation has both a palliative and a curative effect in acute infections of the upper respiratory tract. This measure must not, however, be resorted to alone. As an aid to general therapy, local treatment frequently relieves the distressing symptoms of an acute rhinitis or an acute sinusitis. Contrary to the older methods of applying infrared, the prolonged radiation is now preferred. Recent investigations tend to attribute the beneficial results to a chemical reactivity rather than a local hyperemia. The generator lamp should be placed at a distance from the patient's face so that a comfortable tolerant heat can be borne for one hour or more. Repeated applications are especially conducive to prompt action. When possible, the patient is best placed in a semi-reclining position.

Vaile (*Canadian M. Assn. Jr.*, **22**:198, Feb., 1930), employed radiant heat as an adjuvant to other measures, in the treatment of accessory sinus disease in children. Surgery was avoided in all cases of infants and young children by the combined use of suction and radiant heat as these measures were sufficient to effect a cure in nearly all cases.

The technic for the utilization of infrared for children is similar to that already described. It is only natural to assume that children will not tolerate prolonged treatments and these should therefore be given more moderately so far as dosage is concerned. It is essential, however, to give the treatments frequently and not to forget that they represent only an aid to other indicated therapy.

Q. What are some of the recent developments pertaining to physical therapy in cardiac disease?

A. Gutman (*The Brit. Jr. of Phys. Med.*, **6**:184) calls attention to the fact that the application of physical agencies in the treatment of cardiac disease is not of recent origin. He states: "For many decades thousands of heart sufferers have been crowding the spas of Europe to obtain their well organized cures. The means employed in these are chiefly physical: balneotherapy, graduated exercises, scientific massage, rest cures, etc.; regulation of diet and hygienic living are also, of course, enforced. That physical therapy thus utilized must give satisfaction may be concluded from the fact that the great mass of people, in ever-increasing numbers, makes its pilgrimage to these places year after year, evidently pleased with the results."

Gutman has found physiotherapy helpful in angina pectoris, coronary thrombosis, essential hypertension. The following agencies are employed: high frequency, autocondensation, massage and colonic therapy.

The indications and methods are described in detail in the article referred to above.

CURRENT NEWS AND SCIENCE

A New Westinghouse X-Ray Machine

A new Westinghouse three-element x-ray tube and machine makes possible the taking of an x-ray snapshot in less than 1/1000th of a second. This enables physicians to see clearly, for positive diagnosis, the inside of a human body; up to this time blurred or hidden in x-rays by the motion of the patient's muscles. This new instrument was shown for the first time at the convention of the Radiological Society of North America at St. Louis.

Tonsil Electrocoagulation a Valuable Adjuvant

There is an editorial in the September 19, 1931, issue of the *Journal A. M. A.*, on the Electro-Surgical Removal of Tonsils. The editorial stresses the importance of choice of case for electrocoagulation. Much has recently been written about this method and it is undoubtedly gaining popularity in the hands of the general practitioner, the surgeon and the borderline specialist. Manufacturers of the instruments are partially to blame for the unwarranted popularity because of their excessive claims of advantages. Tonsillectomy should still be considered a major surgical operation and in competent hands, in indicated cases, there is no doubt but that electrocoagulation is of service; however, the feeling prevalent today among the recognized specialists is that electrocoagulation is merely another valuable adjunct to the armanent used in tonsillectomy.

Discovery Made That Liver Conserves Heat of Body

A new function of the liver, that of saving heat when the body is chilled or at the onset of fever, has been discovered by Dr. Henry G. Barbour of Yale University who reported his work to the National Academy of Sciences.

"The onset of fever resembles the reaction of the body to cold," Dr. Barbour explained. "The shivering or 'chill' produces extra heat and this heat is saved by withdrawal of most of the surface circulation."

Dr. Barbour found that when fever is produced, the blood becomes more concentrated and loses part of its water content. At the same time, he found that the water content of the liver was increased. Since the chief way in which the body loses heat and becomes cool is by evaporation of water, as in sweating, he reasoned that the liver takes up the water lost by the blood at the start of fever, and thus saves heat for the body by preventing heat loss through water loss and evaporation.—*Science News Letter,* November 28, 1931.

Ink Absorbing X-Rays Aids in Identification

A special ink that absorbs x-rays and can be used to mark x-ray films for later identification has been devised by Captain T. W. Raison, M.C., and Chief Pharmacist's Mate H. C. Walker, U. S. N., at the U. S. Naval Hospital at Great Lakes, Ill. The formula calls for water, sodium iodide, barium sulphate, mucilage of acacia and chloroform.

The radiographs are marked and witnessed at the time of exposure. A ball-pointed pen is recommended for use with this ink, and the writing should be done rather slowly in order to produce a broad, heavy line. The method is not practical for routine use because of the time involved, but is valuable for radiographs intended for medico-legal cases where it is desirable to have the signature of the patient and witnesses on the border of the film.

The ink is not sufficiently absorbing to produce a marked x-ray shadow, but samples of writing made with it were clearly legible, according to the report in *Radiography and Clinical Photography.*—*Science News Letter,* November 28, 1931.

Dr. J. B. H. Waring

announces the removal of his Cincinnati offices to 6075 Montgomery Road, Pleasant Ridge.

Electricity and the Heart

The tragedy at Keyport, N. J., when a three-year-old girl was killed by accidental contact at the same moment with the electric wiring and a radiator, is another evidence of a danger too little appreciated by users of electricity. The 120 volts or less usually employed in household electric circuits is not ordinarily dangerous to life. Accidental contact with the live wires may cause a painful shock or a minor burn, but seldom is fatal. There are circumstances, however, which dangerously alter the case. Simultaneous contact with the live wire and with a grounded radiator, water pipe, bath tub, or similar article is one of these dangerous circumstances. Another one is wet skin, so that the protective electric resistance of that body covering is lowered. This is why bathers in tubs are especially susceptible to shocks from the house wiring and why tragedies like the Keyport one are especially common in hot weather, when the average skin is wetted by perspiration.

Prof. Horatio B. Williams of Columbia University recently reported experiments establishing why it is that these relatively feeble shocks from low voltage wires may be fatal. The trouble, he finds, is not that any organ of the body is destroyed or seriously damaged by the current, as might happen with a high voltage. The occasional fatal effects of feeble currents are due, instead, to interference with the regular rhythm of the heart. Shocked even mildly by electricity, some hearts fall into what experts call fibrillation, a state in which the regular contractions of the muscle fibers of that organ are replaced by irregular quivers, like a frightened individual whose muscles shiver so that he cannot make them obey. This quivering interferes, of course, with the pumping of blood by the heart. The brain is deprived of oxygen. Death soon follows.

By prompt treatment this quivering of the heart sometimes caused by feeble shocks may be stopped, the regular rhythm restored and the victim saved, but it is better to avoid the accident. People should be especially careful in hot weather, Doctor Williams advises, not to make simultaneous contact of their wet skins with grounded articles like pipes or radiators and with any electric wire or fixture. It is a good rule, in fact, never to touch any electric article and any grounded metal article at the same time. Lamps and other electric fixtures are supposed to be insulated against contact with the wires, but the insulation occasionally is imperfect.—*Internat. Jour. Med. and Surg.*

Mental Ability Increased After Period of Fasting

If you wish to prepare to do your best at an examination or some other intellectual ordeal, it may pay to go without food for a while provided you take food again before attempting the mental work.

At least, so it would appear from experiments at the Universities of Chicago and Michigan in which three persons volunteered to go without food for 10, 17 and 33 days, respectively. The results were reported to the American Association for the Advancement of Science by Dr. J. A. Glaze, of Kansas State Teachers College.

Starvation does not improve the mental processes during the actual period of the fast, but it does improve the steadiness of the hand and the ability to stand at "attention," Dr. Glaze told the meeting.

After the fast is broken, however, the persons who starved themselves were rewarded by greatly increased mental ability on all tests taken. The improvement in performance over that before the fast was remarkable. Physically, also, they were much more fit.—*Science News Letter,* January 2, 1932.

Cosmic Rays Again Shown Like Radium Gamma Rays

Further support of the theory that the mysterious cosmic rays are waves, is offered by Dr. R. A. Millikan and Dr. I. S. Bowen of the California Institute of Technology in a letter to *Nature.*

The long struggle to establish the real nature of these penetrating radiations from outer space has engaged physicists both in America and Germany. Dr. Millikan's faction has favored the theory that the effects are caused by non-material waves like light or radium gamma rays. His critics, led by Dr. Walter Bothe and Dr. Werner Kolhoerster in Germany, believe that the rays are corpuscles, probably electrons.

A doubling of the signal strength was not found by Drs. Millikan and Bowen when the

air pressure in the recording electroscope was doubled, contrary to what might be expected. Radium gamma rays, however, they now find, show just this same behavior when they act on the electroscope.

Thus changes of pressure in the electroscope affect the two radiations equally and support Dr. Millikan's idea that the rays are similar in nature. Lack of "saturation" in the currents flowing through the recorders is the cause of the observed absence of proportionality.—*Science News Letter,* December 19, 1931.

A Portable Cathode-Ray Tube

The General Electric Co. of America has produced a new cathode-ray tube which is so small, complete with all its equipment, that it can be carried with ease and used on a small table. Although operating at 70,000 volts, it uses ordinary 110-volt house supply, a small semi-fluid immersed transformer producing the necessary high voltage. The tube itself is only 12 in. long overall, with a bulb 3¼ in. in diameter. The "window" through which the cathode rays escape into the air is aluminum foil, the central portion of which has its thickness reduced over a number of small areas to less than a half of a thousandth of an inch. The tube is mounted on a transformer case, measuring 8 in. high, 6 in. wide, and 10 in. long. With the tube in place for operation, the overall dimensions are only 15 in. in height, 7 in. in width, and 14 in. in length. The other case, containing the meters, resistances, and controls, measures 10½ x 8½ x 8½ in. overall. Both cases are provided with carrying handles. It is possible to place the object being rayed within a small fraction of an inch from the window, so that the loss in air, which would be very apparent if the window were recessed, is negligible. The tube is designed to handle a tenth of a milliampere at the rated voltage of 70,000.—*Electrical Review,* October 30, 1931.

The Transmission of Electricity Through Metals

Professor J. C. McLennan, Professor of Physics at Toronto University, at a meeting of the McGill University Physical Society announced that as a result of nine years of research he had discovered how electric current passed through metal.

He narrated how he had combined metals which, under very low temperatures, had proved themselves perfect conductors of electricity. These alloys, made into rings, have carried an undiminished flow of current round and round for hours at a time, the flow, in some experiments, having measured up to 100 amperes, or enough to have brought 100 electric light bulbs to full brilliance. The temperatures at which these alloys were perfect conductors were created through the use of liquid helium, and Professor McLennan declared that it only remained to discover an alloy which would be a perfect, or nearly perfect, conductor at ordinary temperatures in order to make all existing electrical transmission equipment obsolete.

During the discussion it was pointed out that such further discovery would be revolutionary in its industrial and social consequences, because power manufactured in the northern wilderness of Canada would be available in centers many miles away.—*The Times,* December 7, 1931.

Electrical Injuries

In the summary of an article on this subject, Walter L. Finton (*Journal of the Michigan State Medical Society*) formulates a number of instructive suggestions relative to the treatment: 1. Electrical injuries are on the increase. 2. The extent of electrical injuries is determined by the heat generated and importance of tissues involved. The changes are non-specific for the action of electric current. 3. Low household voltages are not infrequently fatal. 4. The treatment of burns, now well standardized, should be more generally adopted. 5. Delayed amputation in deep destruction of extremities is desirable. 6. The difficulty of differentiating between cardiac and respiratory cases necessitates prompt prone pressure respiration in all cases of unconsciousness. 7. Prompt administration of KCl solution promises much in the heretofore fatal cardiac fibrillation cases. 8. For artificial respiration we must depend mostly upon the layman, for the very evident reason that he is about a thousand times more likely to be present during the first and vital few minutes. 9. The addition of oxygen or oxygen and carbon dioxid may be tried, but artificial respiration must never be suspended or time lost in order

to try the addition of these gases. When given they should always be given with a mask or a tube into the throat, so that at least a 30 per cent oxygen mixture can be obtained. 10. Mechanical devices such as pulmotors and lung motors have long since been discarded by most of us, for more lives were lost waiting for their arrival than were ever saved by their use, even when they were in working order. 11. In post-mortem examinations, the failure to find electrical tissue changes does not rule out death from electricity.—*Internat. Jour. Med. and Surg.*

British Empire Cancer Campaign

The Marquess of Reading presides over the annual general meeting of the British Empire Cancer Campaign in the House of Lords on July 20th, and read a letter from H. R. H. the Duke of York congratulating the Campaign on its successful progress. Two items in the annual report are summarized below.

(1) *The Radium "Bomb."* Caution is expressed as regards the value of the radium bomb. The 4-gram apparatus at the Westminster Hospital Annexe has proved to be dangerous, rapid diminution of the blood cells occurring after twenty-five to thirty hours' treatment. There is a small decrease in the red cells, but the total white cell count falls from 7,000 to 3,000 or even less, the lymphocytes being particularly affected. The polymorphonuclear tends to occur, moreover, with a greater proportion of immature forms. When the exposures have been small, however, and spread out over a longer period of time, a definite increase in the white cell count has been detected. The damage caused was not irreparable, periods of rest being followed by a return to the normal. Treatment for one week impaired the urea concentration power in ten patients, and it seemed likely in some cases that damage had been caused to the kidney in the form of glomerular hypertrophy and oedema, and necrosis of the loops of Henle with shedding of the tubular epithelium.

(2) *Pelvic Cancer.* An increase in the amount of radium available for the Marie Curie Hospital enabled a larger number of patients to be treated. A rather unexpected finding was that cases of adenocarcinoma of the uterus responded as well as those of squamous-celled carcinoma of that organ. In cancer of the cervix, conclusive evidence was obtained that the use of supplementary external irradiation when the parametria were invaded, and especially when there was fixation, materially increased the number of five-year cures.—*Brit. Jour. Rad.* (December), 1931.

Physical Therapy in Traumatic Conditions

A series of conferences and demonstrations on physical therapy in traumatic conditions is being given at the New York Academy of Medicine, Tuesday and Thursday afternoons, at 4:30 o'clock, under the auspices of the Medical Societies of the Counties of New York and the Bronx. The first lecture was given on Tuesday, February 9th, by Dr. William V. Healy, on Indications and Contraindications. On Thursday, February 11th, Dr. Heinrich F. Wolf discussed Uses and Technic of Superficial Heat Measures, and on February 16th, Dr. William Bierman demonstrated Uses and Technic of Diathermy. Other lectures on the program are: Uses and Technic of Massage and Therapeutic Exercise, by K. G. Hansson, Thursday, February 18th; Electrodiagnosis; Galvanic and Low Frequency Currents, by Dr. Richard Kovacs, Tuesday, February 23rd; The Compensation Viewpoint, by Dr. Herman L. Ries, Thursday, February 25th. Practical demonstrations will be given in the physical therapy departments of the following hospitals: Beth Israel, Joint Diseases, Ruptured and Crippled, Montefiore, Mount Sinai, Polyclinic, Reconstruction, and the Vanderbilt Clinic.

Machine Outdoes Physician in Detecting Artery Hardening

A special machine which can dedetermine the presence of hardening of the arteries when a physician cannot determine it by ordinary tests was demonstrated for the first time at the Graduate Fortnight of the New York Academy of Medicine.

This and other new instruments for diagnosing heart disease are included in the exhibit which is a special feature of this year's Graduate Fortnight. More than 2,500 physicians from all over the United States and from Canada and England are attending the Fortnight to learn the latest developments in the diagnosis and treatment of heart disease and disorders of the circulation.

The exhibit covers almost every known fact pertaining to the circulatory system, according to the director, Dr. Louis Gross, pathologist of Mount Sinai Hospital.

Another machine on exhibit automatically registers the heart beats of a patient undergoing an operation. This enables the physician or his assistant to tell just what condition the patient's heart is in without stopping to take the pulse or listen to the heart with a stethoscope.

Dr. Maude E. S. Abbott of McGill University and Dr. John L. Bremer of Harvard Medical School have arranged a special exhibit of hearts which traces the growth of the organ in the embyro. In addition, Dr. Abbott has an exhibit which displays all the known forms of congenital heart disease. In this display are hearts of persons who lived despite the fact that they had holes where heart muscle should be and despite the fact that they lacked an entire heart valve or the aorta, main blood vessel from which all the arteries rise.

Motion pictures showing the heart valves in action and showing studies under the microscope of the first heart beat of the embyro are other interesting features of the exhibit.—*Science News Letter,* October 31, 1931.

New Liverpool Radium Institute

The foundation stone of the new Liverpool Radium Institute and Hospital for Cancer and Skin Diseases, in Myrtle Street, was laid on November 23rd by the president, Lord Derby. The chairman of the hospital, Alderman H. M. Miller, said that the time had come when reconstruction, rearrangement, and enlargement had been found to be absolutely necessary. The committee had long contemplated such a step—some might say they had been too long—but nothing had been decided without careful consideration. They had been determined that everything should be of the highest quality, and the plans had been revised several times. Replying to the vote of thanks, Lord Derby said that the value of a hospital lay as much in its research work as in its treatment, and that these two departments together could only be carried on successfully provided there was the fullest confidence and co-operation between them. Cancer was the most dreaded disease. For every person who had it there were 400 to 500 people who imagined at one time or another that they had the disease, or were going to get it. Fear of the disease was about as bad as having it. This hospital dealt with cancer, and was prepared to use not only radium, but every kind of treatment, in cancer cases that the medical profession recommended. The hospital received patients from the whole of West Lancashire, West Cheshire, South Westmorland, North Wales, and the Ise of Man. Even in these troublous times, when rigorous economy was necessary, it was essential that all who had the means should help to alleviate sufferings which that hospital undoubtedly could ameliorate. The new hospital will cost £70,000, and will be on the most up-to-date lines. A deep x-ray therapy equipment is already installed.—*British Medical Journal,* November 28, 1931.

First Dental Physical Therapy Congress

The First International Congress for the presentation of the possibilities in the scientific application of physical therapy in dental practice and its present status in clinical stomatology was held in Paris, August 30, September 1, 1931. The transactions of the congress are to appear shortly and to be distributed from the office of the president of the congress, Professor L. C. Carail, Paris, France. The program included the following scientific contributions by the American section: "Heliotherapy in Stomatologic Practice," by Dr. F. M. Dimas-Aruti, San Juan, Porto Rico; "The Present Status of Physical Therapy in Dental Practice and Clinical Stomatology," by Dr. Alfred J. Asgis, New York City; "Ultraviolet Irradiation," by Dr. I. L. Folstein, New York City; "Problems of Metabolism in Pyorrhea and Decay," by Dr. C. B. Holman, St. Louis, Mo.; "Radio Waves in Applied Oral Therapeutics," by Dr. E. Lester Jones, Jr., Albany, N. Y.; "The Application of Ultraviolet Therapy in Clinical Dentistry," by Dr. Frederick W. Lake, Boston, Mass.; "The Application of Diathermy in the Treatment of Oral Disease," by Dr. T. H. Perlman, Chicago, Ill.; "Ultraviolet Ray Therapy in Mouth Surgery," by Dr. A. T. Rasmussen, La Crosse, Wis.; "The Status of Present-Day Research in Dental Physical Therapy," by Dr. Hobert J. Reade, Toronto, Canada.

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BOOK REVIEWS

ADVENTURES IN BIOPHYSICS. By *A. V. Hill,* Sc.D., LL.D., M.D., F.R.S., Foulerton Research Professor of the Royal Society. Pp. 88. Cloth. Price $3.00. Philadelphia: University of Pennsylvania Press, 1931.

To a certain extent current enthusiasm in physical therapy has paused in its endeavor to catch up with the newer contributions in the field of radiation and is again taking stock of the basic contributions in its discipline. In so doing it finds itself in the peculiar position of discovering that many of its material possessions have been momentarily neglected in this period when the spectacular overshadowed the substantial. The present volume recalls the orthodox background upon which electrotherapy has built in previous years. It recalls the intimate relationship of electro-physiology to the subject of muscle physiology. And like the wanderer who comes back after years of absence he discovers that many changes have taken place in his absence and that a new attitude must be imposed upon that which has existed before.

Since electrotherapy is, frankly, dependent upon interpretations from physiology, these new contributions, called "Adventures in Biophysics" will be found of interest to the practical student of physical therapy. The author, one of the foremost students of the subject and incidentally a Nobel prize winner, informally discusses in these pages the "Status of Vapor Pressure," "The State of Water in the Tissues," "The Conception of the Steady State," "The Time—Relation of Events in Muscular Contraction," "The Mechanics of Muscular Contraction and other Matters." According to Hill, the progress in this field has been so rapid as to be disconcerting. And yet, he says: "It is fortunate to be concerned with a field of research in which one's colleagues are so active, but it makes it no easier to describe the present, or any other outlook. The last three years, indeed, have brought strange and precious growth in subjects which seemed to be reaching into maturity."

For those interested in the subjects mentioned above, the present volume, therefore, offers that unusual opportunity of reviewing the new contributions in this field. The diffidence of the author toward the lasting qualities or rather the permanency of the contributions in this field is worth noting, but we are inclined to feel that in his modesty he has somewhat underrated his and the work of many of his colleagues in this branch of research. "I have avoided," he says, "any detailed alterations in the picture presented in these lectures. No doubt the picture will be old-fashioned again in six months: but still, when the primroses return it may help to explain how they once gave place to blackberries, how—for example and for a season —lactic acid was replaced by phosphagen, equilibrium by steady state, bound water by free."

The informal style of this discussion will be found of great help to those who are not as oriented in this technical and highly specialized field as the physiologist. Nevertheless, the subject as here presented is of such outstanding importance to medicine that we urge the reader to special concentration in its perusal, an effort which will be rewarded by a broader orientation to his specialty.

RADIATIONS FROM RADIOACTIVE SUBSTANCES. By *Sir Ernest Rutherford, James Chadwick,* and *C. D. Ellis.* Pp. 588 with 12 halftones and illustrations. Cloth. Price $6.50. New York: Macmillan Company, 1930.

Sir Ernest Rutherford needs no introduction to students of physics. His classical book, Radioactivity, which appeared first in 1904, and which has since been expanded and brought up to date, is entirely too well known to require description or comment.

Since the World War, the science of radioactivity and the knowledge of the performance of radioactive substances has increased with tremendously rapid growth. The astonishing and wonderful series of radioactive transformations of uranium, thorium, and actinium are most completely understood. Attention today is directed, therefore, more particularly to the study of alpha, beta and gamma rays, and especially to the effects produced by these radiations in their passage through matter. The present volume by Rutherford, assisted by Chadwick and Ellis, briefly surveys the case of radioactive transformations and leads at once to a detailed and authentic study of the nature and effects of alpha rays, beta rays, and gamma rays.

Aside from the enthralling interest for the physicist and for the future development of physical science, this newer aspect of alpha, beta, and gamma rays holds physiological possibilities of intense importance. To be sure, these rays are exceedingly active in a physiological sense and resemble very much the effects produced by x-rays. The slightly penetrating power of the alpha rays confines their effect mainly to skin surfaces or mucous membrane surfaces that directly receive bombardment by this source. Intra-nasal, intra-esophageal, intra-aural, intra-uterine, intra-rectal and other applications of alpha ray sources do not seem to have been systematically conducted and studied, notwithstanding the fact that their action is immediate and pronounced. The exploration of this entire territory may very well lead to important therapeutic contributions of the same order of usefulness in medicine and in surgery as the intelligent application of x-rays or beta and gamma rays from radium. If nothing else, the physician will be interested in Rutherford's authentic account on radiations from radioactive substances and be

given inspiration by way of experimental procedure for the exploration of the use of these rays.

The importance of radium and of radon, with their action in some instances rivaling those of x-rays, is already acknowledged and freely employed throughout the medical scientific world. The development of uses for alpha rays is a matter of the future, but it seems none the less assured of success. For such as are seeking new therapeutic worlds to conquer, no avenue of approach can be more direct than a thorough study of the nature and properties of alpha rays as furnished by this triad of outstanding authors.

LANE LECTURES ON PHARMACOLOGY. By *Walter Straub,* M.D., Ph.D. (h. c.) Professor of Pharmacology, University of Munich. Paper. 88 pages, 9 text figures. Price paper, $1.00; cloth, $1.50. California, Standford University Press, 1931.

It happens not infrequently that books, like personalities first come into the circle of one's consciousness handicapped by a certain personal characteristic which at first blush repels us from the charm and rich content of its inner qualities. Such has been experienced in connection with the present small volume. Its very title suggested that we were faced with dull reading in a subject that has been associated (at least in the mind of the medical practitioner) with uninteresting discussions of a rather dry nature. It is therefore pleasing to record that seldom in our experience has a book been opened with less enthusiasm for the subject in which indifference gave way more quickly to one of extreme fascination.

The volume is comprised of a series of lectures by an outstanding authority, one so thoroughly oriented in his subject, as to enable him to present the facts in that vivid, fascinating and lucid style encountered only in work of rare quality. The contents are made up of a series of lectures delivered on invitation by Professor Strout, of Munich, at Standford University, and deals with such heterogenous subjects as (1) "Intoxicating Drugs"; (2) "Ways to Ideal Anesthesia"; (3) "Digitalis: Chemistry"; (4) "Digitalis: Biochemistry"; (5) "General Pharmacology of Heavy Metals"; (6) "Camphor and the Modern Analeptics". The data as presented by the author has been interwoven with such interesting commentaries of an historical and philosophical nature as to make the entire discussion an intellectual adventure as romantic as any in classical fiction. For example, in discussing intoxicating drugs, the author has managed to present the evolutionary background to the ethnographic and social relationship in connection with the origin, growth and comparative value of such intoxicants as alcohol, opium and morphine, cocaine, cannabis (hashish) and solonacea. In the short space of 14 pages the author has managed to impart information in the first lecture of this series more practical and interesting than is usually found in material ten times its length. And this holds true in connection with the other topics discussed in these pages as enumerated above. Indeed, seldom has the reviewer read a more spontaneous and more lucid exposition on the several subjects as here presented by the author. Whatever the reason for making the subject so vivid and interesting it has been the means of reviving old interests in the latest development in some of the important branches of pharmacology. We heartily endorse this book and urge every medical student and practitioner to read it for the information and pleasure it will give them.

PHYSIOLOGY. By *John Fulton,* M.D. (Clio Medica, a Series of Primers on the History of Medicine. Editor: E. B. Krhumbaar, M.D.) Pp. 131 with 8 illustrations. Cloth. Price, $1.50. New York: Paul Hoeber, Inc. 1931.

Everything is now being done to arouse the intellectual appetite of the medical profession. In the field of book publications there has been a growing opinion that the profession has been in need of more simple, shorter and (shall we say) more appetizing forms of reading material. Our reading appetite has been taxed to such an unusual extent that no doubt it has been felt that more nutritive material could be absorbed by way of more minimal reading dosage than has ordinarily been dished out to us through the ponderous tomes of heavy discourses. The *Clio Medica* series edited by the scholarly Krhumbaar is a case in point. These small pocket editions consist, according to the editor's preface, of "a series of handbooks which aim at presenting in a concise and readable form a number of special phases of the long and complex history that underlies the great edifice of modern medical science".

For presenting the outstanding facts in the realm of Physiology, no happier choice could have been made than in the selection of the present author, Fulton, who brings to these pages a matured orientation on the subject. This fact is demonstrated first, by the style of approach selected by the author —the biographical method, and, second, as a result of this choice, Physiology and its development is here presented in that pleasing, easy flowing, intimate style which enlists attention and disarms one's resistance toward a topic that has been at all times associated with memories of difficult labor. Fulton has properly selected the warm and biographic style of discourse, rather than the scholarly, dispassionate one so frequently encountered in the pages of similar works.

The subject as here presented emphasizes the *contributor* as much as the *contribution.* It discusses the work of the pioneers in the field, such as, Aristotle and Galen; it discusses the work of Harvey and his times, and weaves in the fascinating story of the circulation of the blood, one of the great facts of biological science, as well as one of the most significant in history. Fulton has also developed two other main themes; namely, respiration and digestion. According to the author, "This has the advantage of preserving the unity of three of the most important subdivisions of physiology and it enables one at the same time to bring in the chief personalities".

This small volume should especially appeal to the pre-medical student, the undergraduate, for the inspirational background it depicts for him. At the

same time, the general practitioner cannot afford to neglect the reading of this book because of the information and the pleasure it will give him in recalling the days when assigned reading in this field was associated with more labor and less understanding.

DEMONSTRATIONS OF PHYSICAL SIGNS IN CLINICAL SURGERY. *Hamilton Bailey,* F.R.C.S., (Eng.). Surgeon, Royal Northern Hospital, London. Third Edition, Revised and Enlarged. With 318 illustrations. 277 Pp. Cloth. Price $6.50 net. New York. William Wood and Company. 1931.

While the physical signs in clinical surgery are always uppermost in the mind of the surgeon who endeavors to make a diagnosis, they are nowhere so prominently emphasized as in this volume. The author has sifted these signs from other diagnostic indications and portrays them in a way which is most helpful to the student of clinical surgery. To assist in the individual presentation are the illustrations, mostly photographic and all splendidly made.

The recognition of physical signs involves more than inspection and when other methods are of value these are aptly demonstrated. An example is shown on page 3, the standard method of testing for fluctuation. Another example is shown on page 59, differential cranial percussion, and still another example is found on page 85, the compression test for fractured ribs.

In the introduction the author terms the seven stages of making a surgical diagnosis, the "surgical crescendo." The book deals chiefly with the elicitation of physical signs. Whenever possible every diagnosis should be reinforced by physical signs. No diagnostic aid is avoided and the value of indispensable instruments and laboratory procedures are fully recognized and appreciated. No one particular method is always serviceable, and, too frequently, combinations of them fail to deduce the desired information.

Bailey has succeeded in covering the subject in masterful style. No student or practitioner can well afford to be without this work. The mechanical makeup of the book — the splendid quality paper and the excellent engraving work demonstrate that the publishers desired to present a volume in true keeping with a scholarly scientific effort.

THE PHYSICIAN THROUGHOUT THE AGES. A Record of the Doctor from the Earliest Historical Period — Embracing a General Survey of the Practice of Medicine — The Social History of the Doctor — With Medical Chronology and Biographies of Outstanding Physicians. By *Arthur Selwyn-Brown,* B.Sc., M.A., Ph.D., LL.D., Assisted by Distinguished Medical Specialists. Vols. I and II. Illustrated. New York: Capehart-Brown Co., Inc. 1928.

The purpose of this work, as stated in the foreword, is to follow the development of the physician from the remotest times to the present with sufficient detail to enable the reader to form his own conclusions regarding the status of the profession at any given period. There are other features such as the biographies of the outstanding practitioners since classical times, and also, biographical sketches of prominent American physicians of the past century.

Brief histories of the men who have contributed to the present efficient methods of the special branches of medicine are included in the text material. These histories represent the contributions of recognized specialists and are thoroughly authentic.

Other interesting features are the portraits and illustrations. These help to amplify the informative material.

There are few volumes on a broad subject as is undertaken in this work which are as comprehensive as these. The subjects cover an extremely wide range and the references are invaluable to the student as well as to the practitioner who would have to delve through numerous individual books for such a collection of information.

It is difficult to detail the subjects in a brief review. An example or two can be cited. As one peruses the pages, he is struck with the wonderful account of the theory of venous circulation. One is apt to take this as a matter of course, but the fact remains that the discovery of the circulation of the blood contributed a new era in medical science and has justly conferred immortality on its author. Likewise, the history of the founding of modern surgery is something which is not commonly appreciated. Yet its founder, John Hunter, is little known of by those whose historical information is limited. It was he who founded modern surgery and gave it much of its present impetus. Still another interesting account is the one which deals with medical education in the United States. The evolution is almost unbelievable. The chronological advancement of modern medical science is a matter of history — yet the facts are known and here interestingly revealed.

Such subjects as the development of scientific museums and modern women doctors are covered in Volume II. The more specific problems of medicine, immunity, cardiology, urology and radium therapy are discussed at length. An outstanding contribution in this same volume is death and its significance. It in itself, is worthy of intensive reading and study.

The index is very helpful because of its excellent preparation. Its divisions are such as to enable one to make a quick reference to subject or author.

The work as a whole represents a lifetime undertaking. The editor and the publishers merit extraordinary appreciation from the medical profession for these splendid volumes of wholesale information on subjects which are always of importance and interest.

INTERNATIONAL ABSTRACTS

An Efficient Procedure in the Use of Air Cooled Ultraviolet Radiation and Some Results Following this Formula. Charles M. Hanby.

Phys. Therap., **49**:214 (May), 1931.

An intensive experience in the use of ultraviolet radiation has brought me to the conviction that the safest, most pleasant, and best clinical formula in the use of this radiation comprises (1) exposures of low intensity, (2) exposures of brief duration, (3) complete avoidance of any reatcion more than that represented by a slight pink coloration of the skin, and (4) relatively frequent repetition of treatment and a prolonged course of treatment. Although I have experimented variously with many additional methods promulgated by numerous authors, I feel that the formula described is always safe and is almost always effective.—Author's Summary.

The Temperature of the Endothermic Knife. Mary D. Waller.

Brit. Jour. Rad., **4**:178 (April), 1931.

A method of measuring the temperature of the endothermic or surgical diathermy "knife" is described.

A small thermo-couple is formed with the cutting needle, and the deflections of a moving coil galvanometer indicate the temperature attained by the needle when cutting animal tissues.

It is shown that the temperatures are of the order 50° C. to 400° C., according to the nature of the cutting.—Author's Summary.

Ultraviolet Irradiation and Autohemotherapy in Late Syphilis. E. Rajka and E. Radnai.

Arch. Derm. and Syph., **24**:228, (August), 1931.

Remarkable results were obtained through general intensive ultraviolet irradiations combined with injections of autogenous blood in cases of old latent syphilis that showed positive Wassermann reaction in spite of chemotherapy, and in cases of cardiovascular syphilis and neurosyphilis (mostly tabetic) in which chemotherapy and nonspecific treatment had been employed without effect. Each treatment consisted of thirty ultraviolet irradiations and twenty injections of blood. The blood was taken half an hour after the beginning of the ultraviolet irradiation.

The Effect of Ulraviolet Irradiation on the Antiscorbutic Vitamin of Liquid and Dry Milk. G. C. Supple and Odessa D. Dow.

Am. Jour. Dis. Child., (June) 1931.

1. Ultraviolet irradiation of milk in liquid form, as a thin film for a few seconds and under conditions that imparted to it marked anti-rachitic properties, caused a slight but definitely measurable destruction of the antiscorbutic vitamin. This degree of destruction, under the conditions prevailing in these experiments, is probably of no greater consequence from the nutritive standpoint than the inherent variations in the vitamin "C" content of nonirradiated fluid milk.

2. Dry milk irradiated by ultraviolet rays for periods of three and twenty minutes and under conditions that imparted to it marked anti-rachitic properties showed no evidence of the destruction of vitamin "C" due to such irradiation.—*Authors' Conclusions.*

Infraroentgen Ray Therapy of Skin Disease. F. Blumenthal and L. Böhmer.

Deutsche med. Wchnschr. **57**:404 (March 6) 1931.

Blumenthal and Böhmer first discuss the nature of infraroentgen (grenz) rays. Compared with the roentgen rays, the infraroentgen or border rays have only a slight penetrative power, so that the largest portion of the irradiation is absorbed by the upper layers of the skin. It is pointed out that Bucky, who first recommended the use of these rays, emphasized their harmlessness. But because it is necessary to apply much larger doses than is necessary in roentgen irradiation in order to obtain therapeutic results, the relative harmlessness is partly nullified. The authors further direct attention to the difficulties that are encountered in the dosage of the infraroentgen rays. They found that the erythema which is produced by the rays, in the majority of cases, disappears after several days, without causing other results than an intense pigmentation, which requires a longer period for regression, and which for this reason is disadvantageous, especially if the face is involved. Occasionally, however, erythemas develop that cause severe, subjective disturbances, and their healing requires several weeks. In regard to the therapeutic effects of infraroentgen rays, the authors state that in superficial dermatoses (eczema, psoriasis and so on) in which the infiltrates were not deep, the same results were obtained as are effected with roentgen surface irradiation, except that the process was somewhat slower. In cases with deeper infiltrations, however, the efficacy of infraroentgen rays did not reach that of roentgen rays unless the erythema dose was far exceeded, and injurious effects had to be feared. In lupus, in tuberculosis verrucosa and in mycosis fungoides, favorable results were obtained with infraroentgen therapy. The authors think that there are no essential differences between the action of infraroentgen rays and that of roentgen rays. The differences are only quantitative; namely, in the penetrative power and the absorption. It is true that in infraroentgen treatment the largest portion of the radiation is absorbed by the superficial layers

of the skin, but a part penetrates to the cutis and to the subcutis and here exerts the same influences as ordinary roentgen rays. Nevertheless, the authors recognize that the infraroentgen rays represent an essential enrichment of therapeutic resources, whenever it is desirable to prevent deep penetration. They are specially helpful in the treatment for dermatoses in which the hair follicles are to be spared or in which roentgen-susceptible tissues (parotid, generative glands) are involved. Another advantage is that in extensive dermatoses it is possible to prevent such secondary reactions as roentgen intoxications. The therapeutic effects of the infraroentgen rays are not exceptional and not superior to those obtainable by ultraviolet irradiation.—*Arch. Derm. and Syph.*, (October) 1931.

Physiologic Effects of High Frequency Current: Respiratory Metabolism and Changes in Blood of Anesthetized Dogs. E. S. Nasset, F. S. Bishop and S. L. Warren, Rochester, N. Y.

American Journal of Physiology, February, 1931.

Experiments are described by Nasset and collaborators which show that high frequency current as applied to anesthetized dogs is capable of raising their average body temperature 3.6 to 8.5 degrees C. The respiratory metabolism was increased 27 to 172 per cent. The rate of respiration in some cases increased twenty-five fold. Whole blood carbon dioxid content, as well as plasma carbon dioxid content, was decidedly diminished. When the average body temperature reached 41 or 42 C., the blood sugar concentration fell rapidly while the nonprotein nitrogen concentration showed a large increase. The blood chlorid concentration failed to exhibit any gross change. The location of the electrodes, whether across the head or across the trunk, did not influence the character of the results.

Permanent Alopecia Following Roentgen Radiation for Mycosis of the Scalp. A. Buschke and Rolf Doctor.

Dermat. Wchnschr. **91**:1747 (Nov. 29) 1930.

Permanent alopecia occurred following an epilation dose administered to the scalp of a girl, aged 6 years. A sister aged 9 and a brother aged 12, treated at the same time, did not show permanent damage. The dose administered was somewhat higher than that used at present, but the authors feel that there is a danger of encountering unusual sensitiveness due perhaps to constitutional conditions. They have tried acetate epilation, but are not entirely satisfied with its action and are at present inclined to favor a combination of small doses of this drug with subepilation doses of either roentgen or Grenz rays.

Bordier's Method in the Treatment for Infantile Paralysis. Manuel and Arce.

Paris méd. **2**:517 (Dec. 13) 1930.

The authors obtained excellent results by following Bordier's method during the epidemic of infantile paralysis in Madrid in 1928. Degeneration should be studied with the electric current, so that the treatment may be graded. The best results are obtained early and treatment should be begun as soon as paralysis sets in. The method consists of applying roentgen therapy, diathermy and electrotherapy. Roentgen therapy causes the edematous infiltration to disappear. Diathermy acts as a vasodilator, antispasmodic and temperature regulator. Electrotherapy is usually begun in the second month and aids regeneration.

The First Cases of Anterior Poliomyelitis Treated by the Method of Delcroix. Emilio Roviralta.

But. de la soc. Catalana de pediat., **1**:39 (April) 1928.

Two patients with anterior poliomyelitis, in the paralytic stage, were treated by the method of Delcroix (combined ultraviolet light and warm sea bathing). One patient improved slightly; the other showed great improvement more than six months after paralysis was first noted. The author recommends the preparation of stock human convalescent serum, like that made in North America, as the most effective means of control of poliomyelitis.

More About Ultraviolet Glass: Ultraviolet Window Glazing. H. E. Beckett.

Building Research Bull. 8 (Department of Scientific and Industrial Research). Current Comment, *Brit. J. Actinotherapy*, **5**:180 (Dec.) 1930.

Calculations are presented which confirm the results of measurements made by other observers, that the intensity of ultraviolet radiation decreases with great rapidity when the subject moves back from a window of ultraviolet glass. The general conclusion of the report, based on a review of the work done by various investigators, is that ultraviolet glass is not worth while unless there are sufficient ultraviolet rays incident on the window. The *British Journal of Actinotherapy* supports this view, stating that the problem is to determine what may be "sufficient intensity." They say further that little advance will be made in this and kindred investigations until some standard and simple method of actinophotometry has been devised. Until then it is impossible to correlate the results of one piece of research with those of another.

Electrocautery in Tuberculosis of the Larynx. W. E. Vandevere.

Southwestern Med., **15**:564 (December) 1931.

SUMMARY

1. Laryngeal tuberculosis is a complication of pulmonary tuberculosis in from 12 to 45 per cent of cases, depending on the severity of the pulmonary lesion.

2. The tuberculous lesion is healed by the deposit of calcium salts in the necrotic areas and by an increase of fibrous tissue which develops from the fixed connective tissue cells, and probably by a changing of the epithelioid cells in fibroblasts. Such healing processes are encouraged by an increased blood supply.

3. Rest is important in all cases of laryngeal tuberculosis. The electric cautery is used in all tuberculosis ulcers, and infiltrations which do not

respond to rest of the larynx. Heliotherapy is used in many cases.

4. The electric cautery heals, not by the destruction of all tuberculous tissue, but by the development of an inflammatory zone in which newly formed blood vessels and fibroblasts are produced, which hastens healing by cicatrization.

5. Most early cases heal with the cautery, while the advanced cases are relieved of pain.

6. Electric cauterization is a minor procedure, done best under cocaine anesthesia and by the indirect method. — *Author's Summary.*

Chronic Otorrhea and Its Treatment, With Special Reference to the Use of "Iodin Dusting Powder" and "Zinc Ionization." Andrew P. T. Tsoong.

The Laryngoscope, **42**:34 (January) 1932.

In this article the author advocates the use of zinc ionization for chronic otorrhea. The technique is similar to that used by other men. A limited number of case reports are included and discussed in detail. The author states, "In the treatment of chronic otorrhea, it is not only important to check the diseased process and stop the discharge, but also important to preserve and restore the function of the ear as much as possible. The experience of most otologists tells us that a radical operation on the ear results in most instances in a depression of the hearing. In other words, an improvement of hearing in most cases of chronic suppurative cases can be brought about only by local conservative measures. Therefore, in the absence of an actual complicating lesion, the attempt should always be made to treat all cases of chronic otorrhea conservatively. In the local conservative treatment, time, patience and willingness on the part of both patient and the attending physician are necessary.

"In the above report, because of such a small number of cases and short space of time, it is difficult to interpret the results of treatment by zinc ionization, iodin dusting powder, or the combination of both. Nevertheless, the writer believes that they are valuable adjuncts to our local conservative measures for the treatment of chronic otorrhea. The combined use of the two especially may be considered as one of the most valuable therapeutic aids for the treatment of more stubborn cases of chronic suppuration. A persistent treatment should be encouraged as long as there is a steady improvement of the case, with no signs of a complicating lesion."

Treatment of Cancer of Lip by Electrocoagulation and Irradiation. George E. Pfahler and Jacob H. Vastine.

Jour. A. M. A., **98**:32 (Jan. 2) 1932.

The authors emphasize the fact that in cancer of the lip the technic and plan of treatment should always be adapted to the individual case, because cancer does not develop according to rule and cannot be treated by any fixed rule. The aim should be to treat all cases in the very early stages in which the local lesion is small and devoid of palpable lymph nodes. One should always use bimanual palpation with one finger in the mouth and one outside in order to detect early lymph nodes. In such early cases it is the authors' custom to use a fine needle with the high frequency current and surround the lesion with a line of local destruction, then remove a specimen for microscopic record, and then destroy the local disease completely. If the disease extends deep enough to reach an artery in an elderly patient with arteriosclerosis, it is their custom now to use a suture ligature instead of simply sealing the area with the high frequency current, so as to avoid a secondary hemorrhage. When lesions are relatively small, this destruction and subsequent roentgen treatment leaves a soft scar and practically no deformity. Then they give an 80 per cent dose of high voltage x-rays with 200 kilovolts and 0.5 cm. filter over the lip and chin, and on the following day a similar dose in the submental and the submaxillary regions; within a week they bring this up to a full erythema dose according to the "saturation" (Pfahler) technic. In the more advanced cases, with local disease of large extent, but still with no palpable lymph nodes, they carry out the same general plan; but if there is likely to be much deformity they try to eliminate the local disease by surface interstitial irradiation with radium, using dental compound or more commonly using the lead clamp method first described by Grier. In the more advanced cases, with local disease without palpable lymph nodes, they increase also the roentgen treatment in the aforementioned fields and add treatment from behind foreward under the angle of the jaw, giving a total of from 200 to 300 per cent of an erythema dose over each field, but never exceeding the "saturation" value. When dealing with primary cases associated with palpable lymph nodes, they usually add radium packs over the lymphatics and at times insert radium needles into the lymph nodes and around the lymphatics likely to be involved. In no instances do they depend on interstitial irradiation alone for either the local or the lymphatic treatment. When radium is not available and electrocoagulation is inadvisable, good results may be obtained by intensive and skillful local roentgen treatment. The combinations described have been more satisfactory than roentgen treatment alone.

Preoperative and Postoperative Treatment of Cancer of Breast by Radiation (Metastasis Excluded). J. E. A. Lynham

Brit. Jour. Rad., **4**:534 (Nov.) 1931.

Lynham believes that in the treatment of cancer of the breast by radiation one has two separate effects to consider: the lethal effect on the actively dividing cells of a tumor, and the cumulative effect on the resting cells of the neoplasm. Both effects are necessary if one is to destroy the tumor. The first is accomplished by adequate intensity of radiation, sustained through a sufficient period to influence the succeeding generations of actively dividing cells. The second may be accomplished by successive irradiations spaced out over a considerable time so as to produce the cumulative effect on the latent cells without doing serious injury to the surrounding tissues of the body. The technic of treatment has been based largely on theories as to the effects produced on cells in active division. Massive single treatments have been urged as most likely to

bring about the desired result; but overdosage should be avoided, for it is not sufficiently recognized that, when irradiation has been too intense, the temporary disappearance of a malignant growth may be merely incidental to a slow but inevitable process of deterioration in the tissues, leading to the death of the patient. Later, divided doses of less intensity have been advocated in the hope of influencing the malignant cells, with less injury to the matrix of the tumor. Comparatively weak doses may sterilize a neoplasm, if sustained over a considerable period of time. The saturation method suggested by Kingery and developed by Pfahler has produced results in breast carcinoma more satisfactory than were achieved either by massive intensity or by weaker dosage distributed over a long period. Success in treatment appears to depend on whether it can accomplish a dual objective—extinction of actively dividing cells and ultimate inhibition of activity in those which are latent. When one considers this view in relation to removal of a tumor by diathermy or excision, it seems to be reasonable that preoperative irradiation should be directed toward the inhibition of the active cells: it should be relatively intense; it should be delivered within a comparatively short period of time; it should include the whole breast and the related lymphatic areas; it should not be of such a character as to damage the tissues or to interfere with the healing of the operation wound, and sufficient time should be allowed for the tissue effects to take place (ten to thirty days) before the operation. Postoperative irradiation has a double duty to perform. At first there are possibly unsuspected actively dividing cells growing in the tissues. Whether present or not they must be presumed to exist, and dosage at first must be based on this supposition. There has been much controversy as to the time at which the treatment should begin. The author believes that the operation wound should be allowed to heal; that three weeks or so should elapse before the irradiation, to enable the tissues to recover from the trauma of the operation. If preoperative irradiation has been performed there need be no misgivings in waiting for the tissues to recover from the disturbance due to the operation. The first series of exposures should in general follow the principles of the preoperative irradiation, but the intensity of each dose should be reduced and the time spaced out over a longer period. Afterward the question of latent cells has to be considered, and it seems probable that they can be controlled only by divided doses extended over a prolonged period and including wide areas of the body.—*J. A. M. A.*, (Jan. 23) 1932.

Electrical Treatment of Neuritis and Writer's Cramp. W. Black Jones.

British Medical Journal, **3689**:531 (September 19) 1931.

The method adopted by Davies consisted, first, of testing for the affected spot. The second stage is that of treatment, and for this purpose the galvanic current is employed. A local anesthetic is next injected under the dermis, the needle is inserted, and the current is turned on; the needle is directed to the point where the pain is most acute. The current should not exceed six milliamperes; the needle is withdrawn after ten minutes.

A New Technic.—Having had an experience of nearly 100 cases, the author has modified this technic slightly. The current used generally does not exceed one milliampere, frequently it is 0.2 milliampere. It is found that five minutes' duration is sufficient for the treatment; frequently after four minutes the patient states that the pain is diminished. Two spots are often treated at one sitting.

As to the apparatus, a pantostat may be used, but for some years he has used four dry cells, which can be carried in a portable case. The weak secondary current of an induction coil gives the faradic current. Frequently one, two or three of the cells are used; more would cause unnecessary pain.

The general results of the treatment show that where one or two spots occur on a particular nerve, the action of the current gives immediate and permanent relief. If the faradic current is again applied to the spot after an interval of a few days, and no pain is felt, it is concluded that the spot is cured. Thus no second treatment is necessary. Occasionally when a spot is found there may be felt under the skin a small nodule; this disappears with the application of the galvanic current; the nodule may be a deposit of uric acid. On the other hand, when a number of spots are multiple, and when they are close together, the results are not so satisfactory and the relief is only partial, or it may be some time before a moderate amount of success is obtained; this is assisted by the internal administration of iodine.

Neuritis occurs usually in superficial nerves. When those near a joint are affected, movement is limited, and the joint becomes more or less crippled. In rheumatoid arthritis the pain is sometimes due to neuritis surrounding the joint; this method gives much relief. Neuritis of the forehead and scalp is often very painful, and does not easily respond to medicinal treatment. Frequently one spot alone is responsible for all the trouble; in such cases the treatment gives immediate relief. In the forehead the nerve which is chiefly affected is the supratrochlear branch of the frontal nerve; this emerges from the orbit and supplies the lower and mesial part of the forehead. Of 28 cases of neuritis of the forehead and scalp, this nerve was involved in 23 cases; in 16 cases it was the only nerve affected.—*Int. Med. Dig.*, (January) 1932.

Roentgen Therapy In Menopause. W. Grabowski.

Pol. Gaz. Lekar., **10**:909 (Nov. 22) 1931.

Grabowski states that in the menopause roentgen therapy is far more economical to the patient than organotherapeutic preparations because of their price and gives satisfactory results in severe cases often unaffected by glandular substitution. The application is simple, consisting of irradiation of the pituitary body through both temples and the frontal region at intervals of three days. The series of applications is repeated every three weeks if conditions demand. Three applications are sufficient in most cases. In stubborn cases, accessory irradiation of the thyroid (after Borak of Vienna) brings speedy relief; this combination gives better results

in severe manifestations. There is no danger of injury of the skin, deeper structures or brain tissue, experiments having proved that brain tissue is insensitive to roentgen rays. The thyroid is irradiated ten days after the pituitary treatment. The dose used is 180 kilovolts and 3 milliamperes through a filter of 0.5 mm. of zinc and 2 mm. of aluminum, and at a distance of 30 cm. — *Jour. A. M. A.*, (Jan. 16) 1932.

Radiotherapy In Cancer of Upper Air Passages. W. D. Harmer.

Lancet, **2**:1057 (Nov. 14) 1931.

Harmer believes that with careful treatment palliative relief can be afforded by ray treatments in a large percentage of the advanced cases of cancer of the upper air passages, with very little danger. It is safer to treat the virulent types of cancer with rays than with surgery alone. Even early cancers may confidently be treated by irradiation by experts. There is reason to believe that external irradiation will be found to be necessary in nearly all cases before local treatment with radium, but it is not clear at present whether roentgen rays or large quantities of radium will produce the best effects.— *Jour. A. M. A.*, (Jan. 16) 1932.

Influence of Ultraviolet Light on Plasma Clot Formation. J. P. M. Vogelaar and W. B. Wartman.

Am. J. Med. Science, **182**:605 (November) 1931.

According to Vogelaar and Wartman, there is a gradual increase in the transparency of a clot formed by adding calcium chloride solution to citrated blood plasma which has been irradiated with ultraviolet rays from one to four hours. These changes were demonstrated both macroscopically and microscopically. The suggestion is made that they are due to an imbibition of water by the fibrinogen when it forms fibrin. This process results in an alteration of the index of refraction of the different parts of the system with a consequent effect on the transparency of the system. — *Jour. A. M. A.*, (Jan. 16) 1932.

Clinical Evaluation of Various Qualities of Roentgen and Radium Rays for Treatment of Advanced Cancer. B. P. Widmann.

Am. Jour. Roentgenol. and Rad. Therap., **26**:729 (November) 1931.

Widmann obtained equally good clinical results with long and short wavelength roentgen and radium rays in a series of epitheliomas of the lip. The skin tolerance is greater for short wavelength radiations; there is more penetration but apparently less absorption. The skin tolerance increased when different short wavelength radiations were combined (roentgen rays: 200 kilovolts and 0.5 mm. of copper; radium: filters of lead with densities equal to 2 mm. of platinum). Radium packs with filtrations of lead and silver (3 mm. of lead and 0.5 mm. of silver, approximately equal to the density of 2 mm. of platinum) were employed for economical reasons, and represent densities approximately 2.5 times the usual 2 mm. of brass. The qualities of these radiations cannot be accurately interpreted with the present physical equipment. The technic described by the author incorporates the principle of Regaud (weak intensities for a long period of time). These combined qualities of radiation admit total intensities of from 230 to 280 per cent skin erythema dose through a given skin area by protracting treatment over a period of from four to six weeks. Improved clinical results justify the recommendation of combined short wavelength irradiation for advanced cancer. — *J. A. M. A.*, (Jan. 23) 1932.

Treatment of Roentgen Injuries with Rays of Long Wavelength. W. Bröcker.

Strahlentherapie, **42**:551 (Oct. 24) 1931.

Bröcker observed that infra-red rays, applied either before or after roentgen irradiation, do not influence the skin reactions produced by the roentgen rays. Animal experiments revealed that the infra-red rays have no prophylactic effect on roentgen injuries. The development of an ulcer could be prevented neither by preceding nor by following roentgen irradiation with infra-red treatments. However, infra-red rays are extraordinarily effective in the treatment of already existing roentgen burns. The author describes two cases of roentgen burns that were refractory to all therapeutic measures but healed as the result of infra-red treatment. —*J. A. M. A.*, (Jan. 23) 1932.

Climatic Factor in Treatment of Tuberculosis: Characteristics of Alpine Climate. B. Hudson.

Brit. Jour. Phys. Med., **6**:163 (November) 1931.

According to Hudson, it is wrong to think that the high mountain climate is advantageous only during the winter. It is the clinical experiences of the medical men of Davos that the summer is as beneficial to suitable cases as the winter, if not more so. Once a case is diagnosed, it is therefore better to send the patient straight out and not, as is often done, to wait until winter. The length of the sojourn is also important. Many patients, even those who can afford a long stay, are advised to spend from three to six months. This is not enough to obtain a really consolidated recovery in a case of tuberculosis. It is better, to remain for two full winters and the intervening summer. A great danger in returning too soon to crowded cities is the liability to contract secondary infections, apparently caused by bacteria of the "filter-passing" groups. They produce catarrh of the respiratory organs, lower the general resistance, and so expose the patient to graver secondary infections, such as the pneumococcal. They also render him liable to a relapse of any tuberculous infection remaining in the lungs. The patient should stay long enough to insure proper consolidation of recovery, so that he can successfully withstand these secondary infections. — *J. A. M. A.*, (Jan. 23) 1932.

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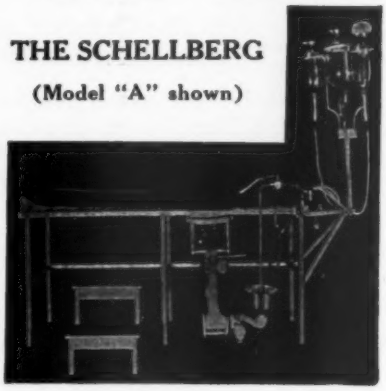

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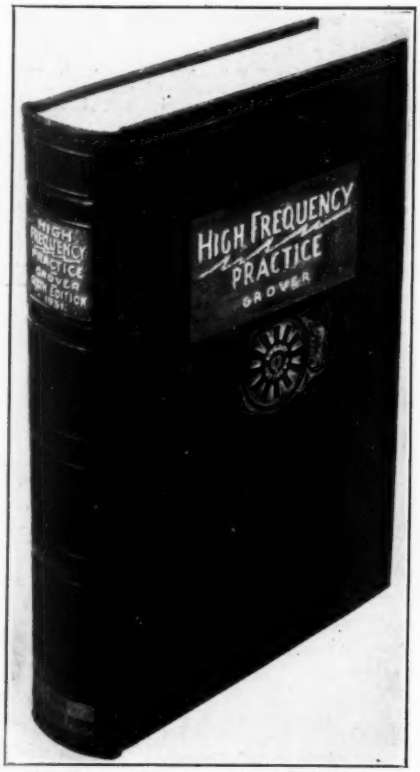

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